Transport Pro™
Patient Monitor
Service Manual

2012659-002 Revision A

GE Medical Systems
Information Technologies

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1 Introduction

For your notes

Manual Information

Revision History

Each page of this manual has the document part number and revision letter at the bottom of the page. The revision letter identifies the document's update level. The revision history of this document is summarized below.

Revision History		
Revision	**Date**	**Comment**
A	1 July 2003	Initial release of this manual.

Manual Purpose

This manual supplies technical information for service representatives and technical personnel so they can maintain the equipment to the assembly level. Use it as a guide for maintenance and electrical repairs considered field repairable. Where necessary the manual identifies additional sources of relevant information and technical assistance.

See the operator's manual for the instructions necessary to operate the equipment safely in accordance with its function and intended use.

Manual Conventions

Product References

Term	Definition
monitor	The whole unit including the display, Tram chute and Tram module.
display	The display only. This does not include the Tram chute or the Tram module.

Intended Audience

This manual is intended for service representatives and technical personnel who maintain, troubleshoot, or repair this equipment.

Safety Information

Responsibility of the Manufacturer

GE is responsible for the effects of safety, reliability, and performance only if:

- Assembly operations, extensions, readjustments, modifications, or repairs are carried out by persons authorized by GE.
- The electrical installation of the relevant room complies with the requirements of the appropriate regulations.
- The equipment is used in accordance with the instructions for use.

General

This device is intended for use under the direct supervision of a licensed health care practitioner.

This device is not intended for home use.

Federal law restricts this device to be sold by or on the order of a physician.

Contact GE for information before connecting any devices to the equipment that are not recommended in this manual.

Parts and accessories used must meet the requirements of the applicable IEC 601 series safety standards, and/or the system configuration must meet the requirements of the IEC 60601-1-1 medical electrical systems standard.

Periodically, and whenever the integrity of the device is in doubt, test all functions.

The use of ACCESSORY equipment not complying with the equivalent safety requirements of this equipment may lead to a reduced level of safety of the resulting system. Consideration relating to the choice shall include:

- use of the accessory in the PATIENT VICINITY; and
- evidence that the safety certification of the ACCESSORY has been performed in accordance to the appropriate IEC 60601-1 and/or IEC 60601-1-1 harmonized national standard.

If the installation of the equipment, in the USA, will use 240V rather than 120V, the source must be a center-tapped, 240V, single-phase circuit.

Warnings, Cautions, and Notes

The terms danger, warning, and caution are used throughout this manual to point out hazards and to designate a degree or level or seriousness. Familiarize yourself with their definitions and significance.

Hazard is defined as a source of potential injury to a person.

DANGER indicates an imminent hazard which, if not avoided, will result in death or serious injury.

WARNING indicates a potential hazard or unsafe practice which, if not avoided, could result in death or serious injury.

CAUTION indicates a potential hazard or unsafe practice which, if not avoided, could result in minor personal injury or product/property damage.

NOTE provides application tips or other useful information to assure that you get the most from your equipment.

Equipment Symbols

Some of the following symbols appear on the equipment.

ATTENTION: Consult accompanying documents before using the equipment.

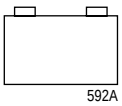
In Europe, this symbol means dangerous or high voltage. In the United States, this symbol represents the caution notice below:
To reduce the risk of electric shock, do NOT remove cover (or back). Refer servicing to qualified personnel.

Defibrillator-proof type CF equipment; type CF equipment is specifically designed for applications where a conductive connection directly to the heart is established. The paddles indicate the equipment is defibrillator proof.

Defibrillator-proof type BF equipment; type BF equipment is suitable for intentional external and internal application to the patient, excluding direct cardiac application. Type BF equipment is type B equipment with an F-type isolated (floating) part. The paddles indicate the equipment is defibrillator proof.

Type B equipment; type B equipment is suitable for intentional external and internal application to the patient, excluding direct cardiac application.

Alternating current (AC)

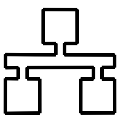


592A

Battery

833A

DC power



593A

Ethernet

834A

Video In

814A

POWER

816A

NBP GO/STOP

817A

ZERO ALL

818A

SILENCE ALARM/ADMIT

4P41

Medical Equipment
With respect to electric shock, fire and mechanical hazards only in accordance with UL 2601-1, and CAN/CSA C22.2 NO. 601.1.

Service Information

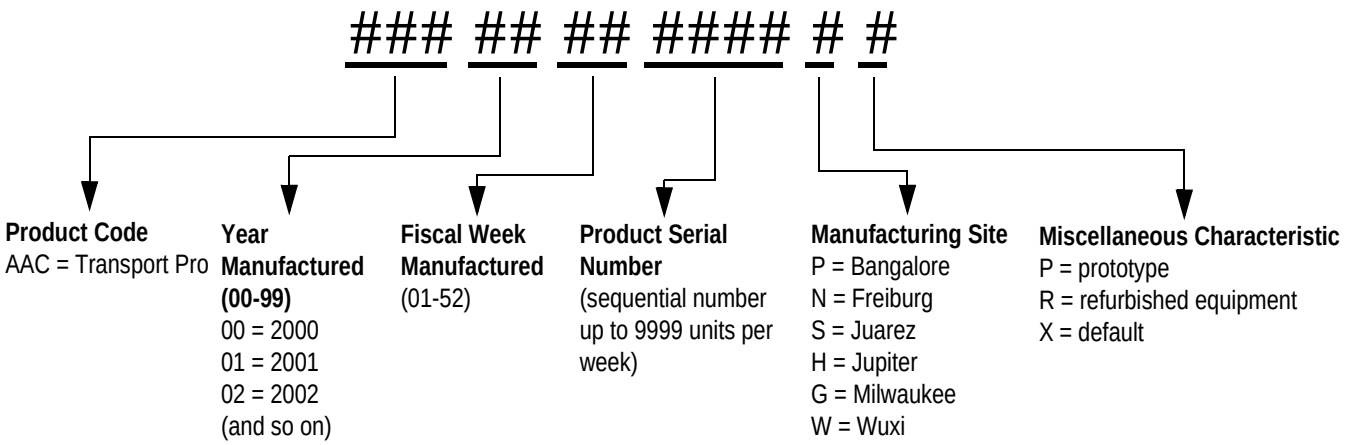
Service Requirements

Follow the service requirements listed below.

- Refer equipment servicing to GE authorized service personnel only.
- Any unauthorized attempt to repair equipment under warranty voids that warranty.
- It is the user's responsibility to report the need for service to GE or to one of their authorized agents.
- Failure on the part of the responsible individual, hospital, or institution using this equipment to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards.
- Regular maintenance, irrespective of usage, is essential to ensure that the equipment will always be functional when required.

Equipment Identification

Every GE device has a unique serial number for identification. A sample of the information found on a serial number label is shown below.



2 Equipment Overview

For your notes

Equipment Description

The Transport Pro Monitor

The monitor is a portable display for the Tram modules to provide a means of displaying patient parameters and data from the Tram during patient transport.

Two rechargeable, lithium-Ion batteries provide power to the display and Tram during transport. An external power supply connector is provided to power the unit from an AC power source and to recharge the batteries. An asynchronous communication port is provided for communications with the Tram module. Unity Network (twisted-pair Ethernet) hardware is provided on the display, but Unity Network functionality is not available in V1A.

The Transport Pro monitoring system consists of the following components:

- Transport Pro display/processing unit
- Tram module
- Tram chute
- Data cable (“curly” cable)
- Batteries (two)
- Optional external power supply (AC power-to DC-power converter)
- Optional external battery charger

Basic System Components

Transport Pro Display/Processing Unit

The display/processing unit consists of the following sub-components.

- Flat-panel display
- Main control/indicator panel
- Processor/Power management circuit board and speaker
- Rear housing

Tram Module

The monitor uses a Tram module to acquire patient data. See “Tram Module Compatibility” on page 2-10 for a list of compatible Tram modules.

Tram Chute

The detachable Tram chute is used to secure one Tram module to the monitor during patient transport.

Data Cable

A cable is connected between the Tram module and the display. This cable provides a communication pathway between the two devices.

Batteries

The monitor is designed to operate on battery power during transport or whenever AC power is interrupted. A complete battery management system allows you to obtain maximum battery performance. Audible and visual alarms alert you when loss of power is imminent and on-screen capacity gauges indicate battery charge condition and capacity.

Optional Components

External Power Supply

The external power supply provides power to the display and to the Tram module. When batteries are inserted into the monitor, the external power supply will also charge the batteries.

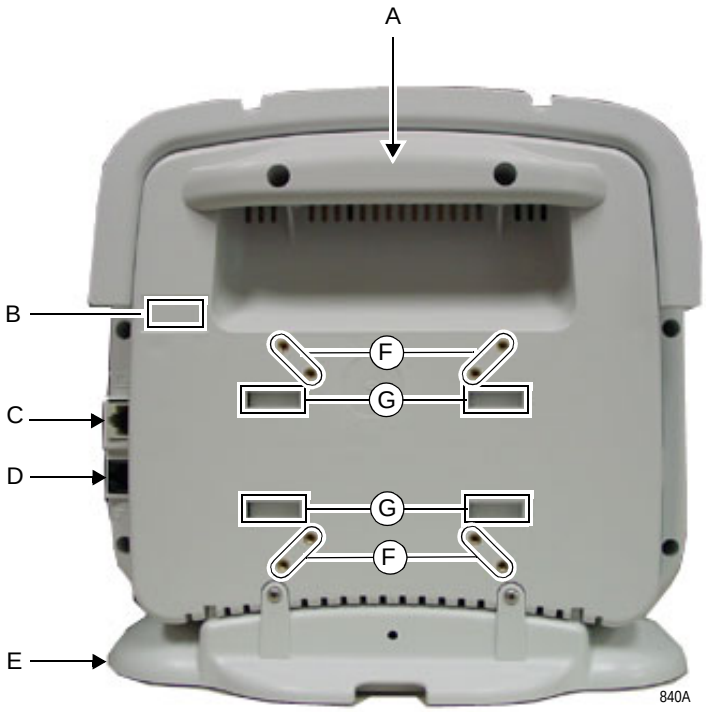
Cadex SMart Two+ External Battery Charger

The external battery charger can hold and charge up to two batteries. When you select the **Target Capacity** switch on the charger, the charger compares the battery's performance to a 60%, 70%, or 80% target capacity set on the battery charger. If the battery fails to meet the target performance, the battery charger will prompt you to condition the battery. If the battery does not hold a charge, then the battery charger will illuminate a "fail" light.

Front View

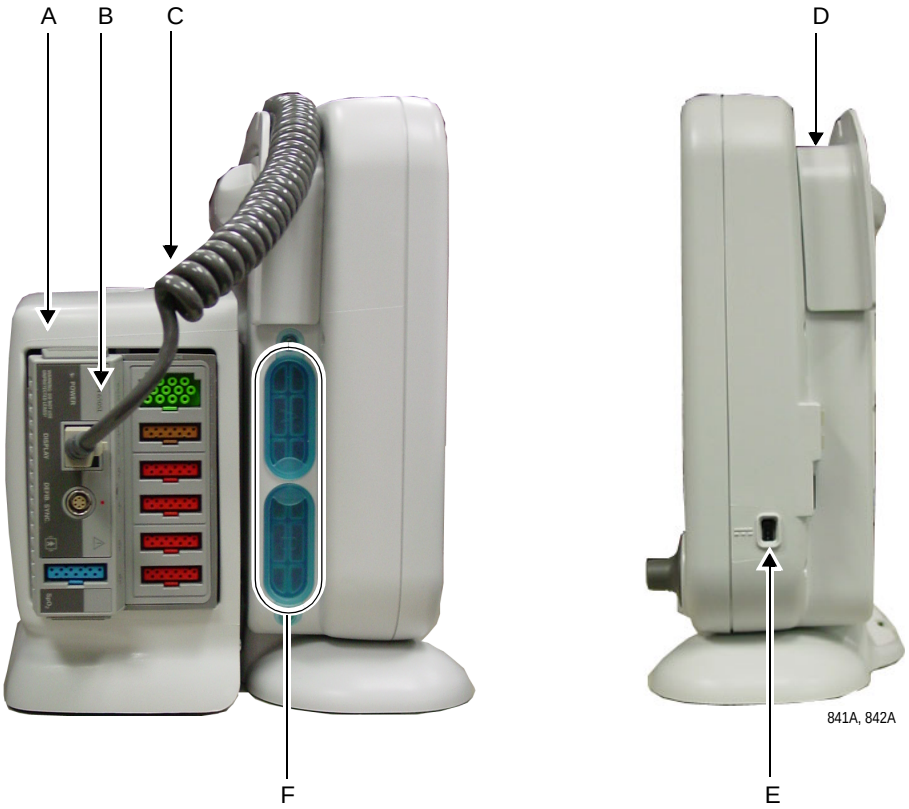
	Name	Description
A	Display	Connect the Tram chute and insert a Tram module to create a transport monitor.
B	Display screen	View waveform and text data.
C	Controls and indicators	Use the control keys and the **Trim Knob** control to configure the monitor and to view or enter data. See “Controls” on page 2-8. The indicators provide information about the power source and the charging status of the batteries. See “Indicators” on page 2-8.

Back View



	Name	Description
A	Handle	Use to carry the display or the transport monitor from place to place.
B	Serial number label	See “Equipment Identification” on page 1-8 for a description of the serial number.
C	Video In connector	See “Connectors” on page 3-8.
D	Ethernet connector	See “Connectors” on page 3-8.
E	Foot	■ Remove to attach the display to an IV pole. ■ Connect to the display when placing the monitor on a table top or shelf.
F	Mounting points	Use the mounting points to attach a standard IV pole clamp.
G	Tram chute mounting slots	Insert and slide the Tram chute mounting tabs. Be sure to insert and secure the Tram chute mounting screw.

Side Views



Left Side **Right Side**

	Name	Description
A	Tram chute	■ Connect the Tram chute to the display and insert a Tram module to create a transport monitor. ■ Disconnect the Tram chute from the display to use the display as a remote display. ■ Disconnect the Tram chute from the display to allow for alternate or permanent mountings of the transport monitor.
B	Tram module	Insert a Tram module into the Tram chute to create a transport monitor. See “Tram Module Compatibility” on page 2-10 for a listing of compatible Tram modules.
C	“Curly” data cable	Connect to the Tram module and to the display. The data cable provides communication between the Tram module and the display.
D	Data cable channel	Place the Tram module data cable in the channel to reduce cable clutter.
E	DC power connector	See “Connectors” on page 3-8.
F	Battery doors	Open the battery doors to insert and remove the batteries.

Controls

Trim Knob Control

The **Trim Knob** control is a 24-position rotary control with a push selection switch.

Power Key

NOTE

This key must be depressed for 0.25 seconds before the function is activated. This helps prevent inadvertently turning the monitor off.

- When the monitor is battery powered, this key turns the monitor power on and off.
- When the monitor is plugged into an electrical outlet using the optional power supply, or when it is powered by a Tram module plugged into a powered Tram-rac housing, this key turns the monitoring standby mode on and off.
- When the standby mode is turned on, patient monitoring is discontinued. However, patient data already accumulated is retained and the battery charging function continues.

Function Keys

Three fixed function keys are provided for **NBP GO/STOP**, **ZERO ALL**, and **SILENCE ALARM/ADMIT**. See the Transport Pro Operator's Manual for a description.

Indicators

Power and battery indicators are also located on the front panel of the monitor.

Indicator	Monitor Label
DC power	823A
Battery power	
Battery charge	821A

NOTE

All four front panel indicators illuminate as the monitor powers up or when the monitor changes between normal mode and standby mode.

DC Power Indicator

The indicator illuminates green when the monitor is connected to an electrical outlet using the optional external power supply (including when the monitor is in the standby mode). The indicator does not illuminate when the monitor is not plugged into an electrical outlet.

Battery Power Indicator

The indicator illuminates yellow when one of the following occurs.

- The monitor is battery powered.
- The monitor is powered by a Tram module plugged into a powered Tram-rac housing.

The indicator is not illuminated when the monitor is not powered by battery or by the optional external power supply.

Charge Status Indicators

The following table explains what the Charging Status indicators mean.

LED Color	Explanation
Yellow	Two battery icons, labeled **Charging Status A** and **B**, illuminate yellow when the respective battery is being charged. If both batteries are present and require charging, then both icons illuminate yellow even though they charge sequentially.
Green	The icon illuminates green when the respective battery is fully charged.
No Light	The icon does not illuminate under the following conditions: ■ The respective battery is not installed. ■ The monitor is operating on battery power. ■ A failure condition has been detected for the respective battery.

“Battery In Use” Indicators

The “Battery In Use” indicator (inside the battery door) illuminates green when the monitor is receiving power solely from the respective battery. The indicators do not illuminate when the monitor is not battery powered.

Neither indicator illuminates when the monitor is operating from both batteries simultaneously (i.e., in a very low battery charge condition when both batteries are joined together in order to sustain operation of the monitor).

Tram Module Compatibility

The monitor is compatible with the following Tram modules.

NOTE

The Tram modules must use Tram software version 9B or later.

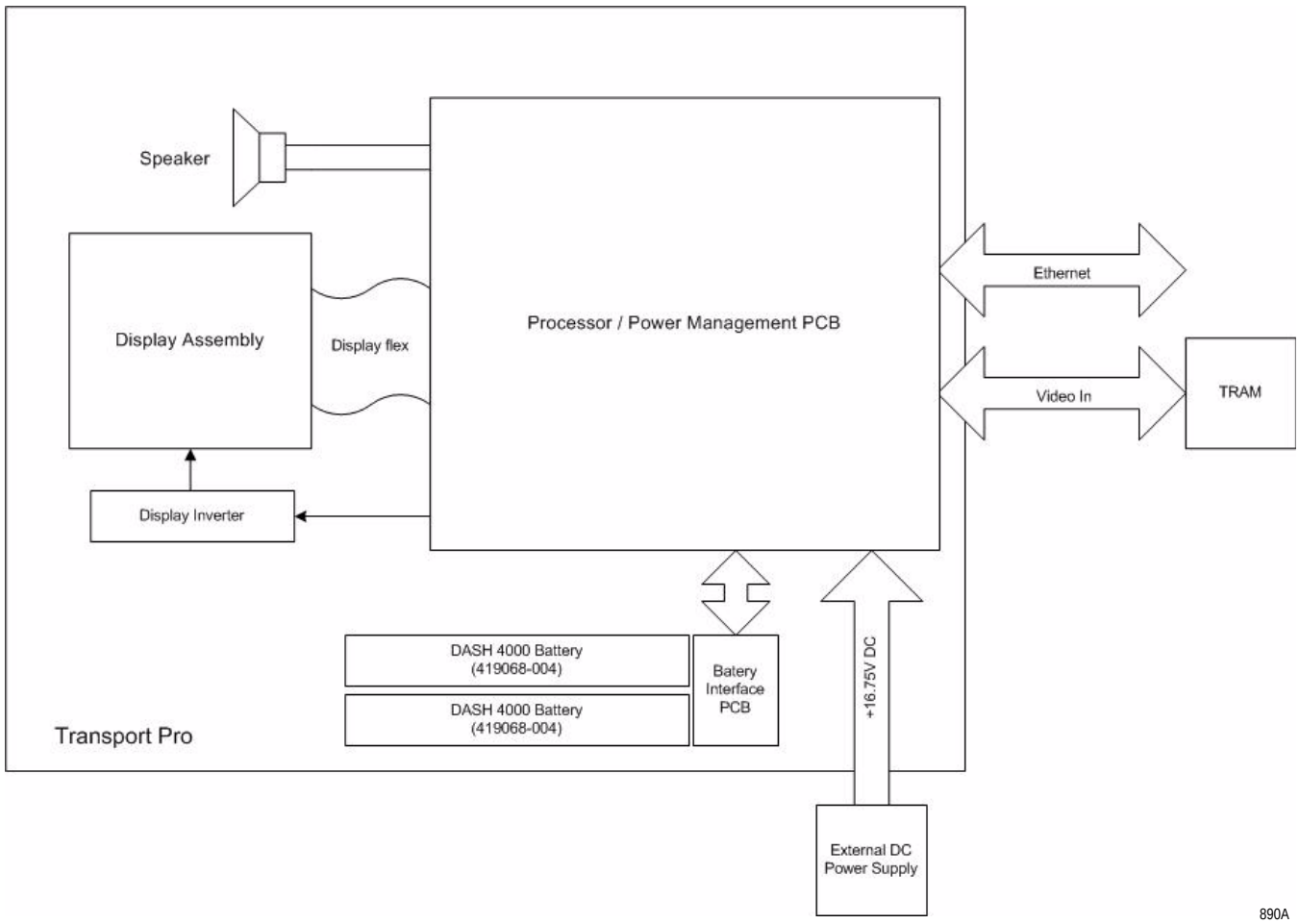
Device	Part Number	Description
Tram 100	401174-00x	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 2 BP, NIBP
Tram 200 A SL	T200=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 2 BP, NIBP, Ohmeda SpO2
Tram 250 A SL	T250=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 2 BP, NIBP, Nellcor/ GEMS-IT SpO2
Tram 350 A	404378-002	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 4 BP, NBP, Nellcor/ GEMS-IT SpO2
Tram 350 M	416646-001	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 4 BP, NBP, Masimo SpO2
Tram 400 A SL	T400=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 3 BP, NIBP, Ohmeda SpO2
Tram 450 A SL	T450=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 3 BP, NIBP, Nellcor/ GEMS-IT SpO2
Tram 451	T451=X	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 3/4 BP, NIBP, GEMS-IT SpO2
Tram 451M	T451M=X	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature,3/4 BP, NIBP, Masimo SET® SpO2
Tram 451N	T451N=X	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 3 BP, NIBP, Nellcor® Oxismart XL® SpO2
Tram 500	402593-00x	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 4 BP
Tram 600 A SL	T600=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 4 BP, Ohmeda SpO2
Tram 650 A SL	T650=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, 4 BP, Nellcor/ GEMS-IT SpO2
Tram 800 A SL	T800SL=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, NIBP, Ohmeda/ GEMS-IT SpO2
Tram 850 A SL	T850SL=A	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, NIBP, Nellcor/ GEMS-IT SpO2

Device	Part Number	Description
Tram 851	T851=X	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, NIBP, GEMS-IT SpO2
Tram 851M	T851M=X	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, NIBP, Masimo SET® SpO2
Tram 851N	T851N=X	3,5, or 10 lead ECG, Respiration, Cardiac Output or Dual temperature, NIBP, Nellcor® Oxismart XL® SpO2

Theory of Operation

Block Diagram

The following theory of operation provides an overview of the various functional circuit boards in the monitor.



Display Assembly

The display assembly consists of the flat-panel display and the main control/indicator panel. (Additional indicators are contained in the Processor/Power Management circuit board assembly.)

Power Supply

The subsystems within the display operate from a common 9 to 18V power bus. Due to the wide variety of voltages required by the various subsystems, power is converted locally by each subsystem. This architecture results in an efficient and compact system by reducing the number of conversions required and optimizing the physical size of each converter for the specific application.

When operating on external power, the power bus voltage is 16.75V, generated by the external power supply.

No external power switch is provided.

The line voltage range of the external power supply is 85V to 270V AC.

Processor/Power Management Circuit Board Assembly

The processor/power management circuit board assembly consists of the processor/power management circuit board, LCD backlight inverter circuit board, and speaker. These items are mounted in an open-ended sheet metal box for additional EMI shielding.

Processor/Power Management Circuit Board

The processor/power management circuit board provides processing memory, user interface, communication channels, power and rechargeable battery hardware functions for the monitor.

LCD Backlight Inverter Circuit Board

The LCD backlight inverter is a DC to AC inverter for a dual lamp LCD. The input voltage is rated at +8V to +18V DC and the output voltage is rated at 300 to 700 VRMS. The start voltage is 1400 VRMS and the lamp current is 7 milliamps per tube.

Speaker

The speaker is used for audible notification of alarms. It is 66mm square, water-resistant, 3 watt, with a frequency response of 400Hz to 4500Hz.

For your notes

3 Installation

For your notes

Requirements

Location

- The operating position does not influence the performance of the monitor in any way.
- Choose a location which affords an unobstructed view of the monitor screen and easy access to the operating controls.
- To optimize battery life and performance, choose a location that does NOT artificially increase the ambient temperature surrounding the monitor.
  - Do not place the monitor near a heat vent or near heat-generating equipment, such as computer monitors.
  - Avoid placing the monitor in corners where the airflow may be restricted.
- Set up the device in a location which affords sufficient ventilation. The ventilation openings of the device must not be obstructed (by external equipment, walls or blankets, for instance). The ambient conditions specified in the Technical Specifications section of the service manual must be ensured at all times.
- The monitor is designed to comply with the requirements of IEC 60601/EN 60601.
- If using AC power, connect the external power supply's power cord to the power line. Use only the original cord or an equivalent one.

WARNING
When connected to AC power, the monitor must be connected to a properly installed electrical outlet with protective earth contacts only. If the installation does not provide for a protective earth conductor, disconnect the monitor from the power line and operate it on battery power.

WARNING
For safety reasons, all connectors for patient cables and sensor leads are designed to prevent inadvertent disconnection, should someone pull on the leads. Do not route cables in a way that they may present a stumbling hazard. Do not install the monitor in a location where it may drop on the patient. All consoles and brackets used must have a raised edge at the front.

Tools

A standard set of hand tools is required to install the patient monitor.

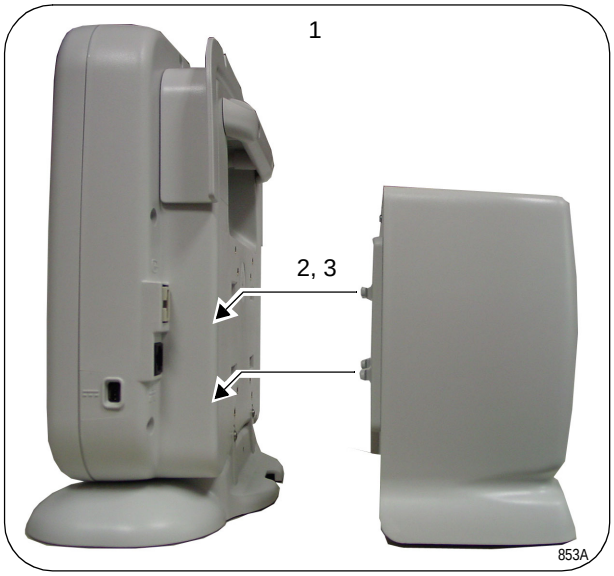
Mounting Options

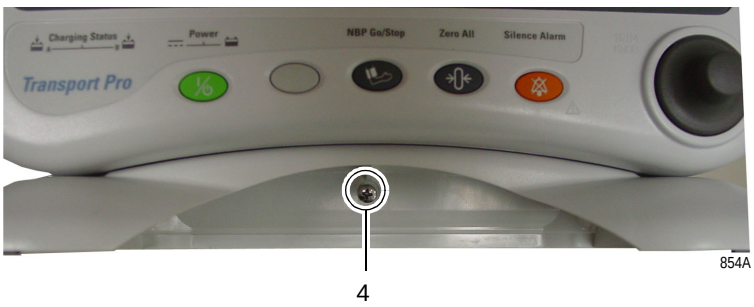
See the “Transport Pro Patient Monitor Bedrail Hook and IV Pole Mounting Kit Installation Instructions” for the mounting options available for this monitor.

Install or Remove the Tram Chute

Installing the Tram Chute

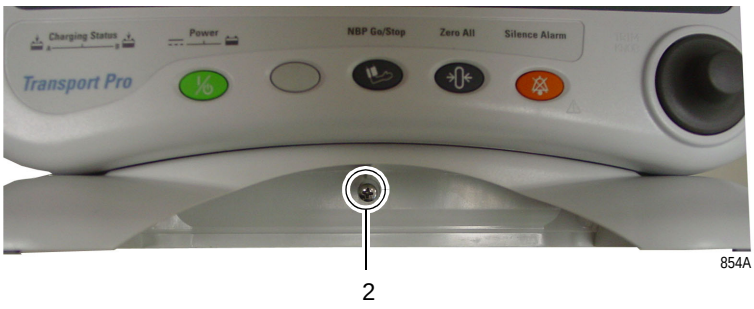
WARNING
DROP HAZARD — Install the Tram chute mounting screw through the display and into the Tram chute to securely lock the Tram chute to the display. Serious injury or death could result if this warning is not observed.

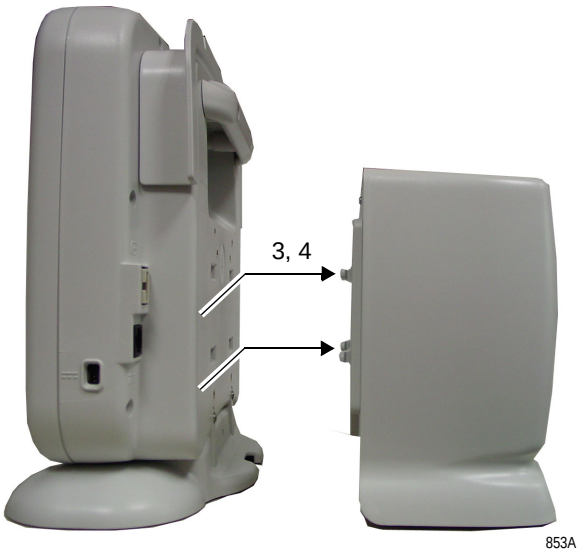


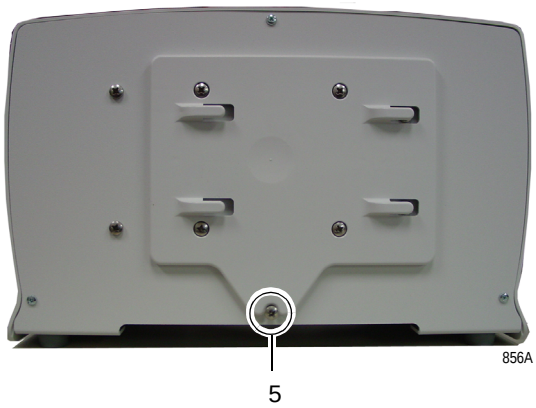


1. Place the display and an empty Tram chute on a flat surface with the back of the display facing the Tram chute mounting tabs.
2. Insert the Tram chute mounting tabs into the display mounting slots.
3. Slide the Tram chute to the left to capture the mounting tabs in the mounting slots.
4. Tilt the unit back and use a Phillips-head screwdriver to install the Tram chute mounting screw.

Removing the Tram Chute







1. Place the display and empty Tram chute on a flat surface.
2. Tilt the display back and use a Phillips-head screwdriver to remove the Tram chute mounting screw from the display and Tram chute.
3. Slide the Tram chute to the right to release the mounting tabs from the display.
4. Remove the Tram chute from the back of the display.
5. Install and store the screw in the Tram chute to prevent it from getting lost.

Install or Remove a Module

A module can be easily installed and removed.

To install a module follow this procedure:

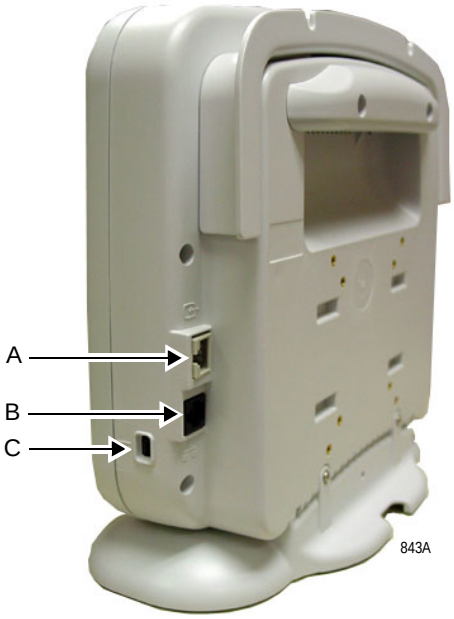
1. Facing the chute, guide the back end of the module into the slot.
2. Gently push the module into the chute. You will hear a click when the module is fully inserted.

To remove a module follow this procedure:

1. Release levers are found on each side on the front of the module.
2. Press and hold the release levers simultaneously and pull the module out about 15 cm (six inches).
3. Once released, grasp the module firmly with both hands and remove the rest of the way. Do not try to hold the module by the release levers.

Connections

Connectors



	Name	Description
A	video in	■ Connect the Tram module data cable to provide communication between the Tram module and the monitor.
B	Ethernet	Use to download software updates from a personal computer. See the Transport Pro Patient Monitor Software Installation Instructions. The monitor does NOT communicate on an Ethernet network at this time. This connector is intended for software downloads only.
C	DC power	Connect the external power supply cable to the display and to an AC power source. The external power supply provides power to the monitor, Tram module, and charges the monitor's batteries.

Connect the Transport Pro Monitor to the Tram Module

Insert the "curly" data cable into the display's Video In connector and into the Tram module's **DISPLAY** connector. The Tram module's **DISPLAY** connector is located on the front of the Tram module.

NOTE

On some Tram modules, this connector is labeled **DISPL.**

Power Up

After making all of the connections, plug the external power supply into an AC wall outlet. All front panel indicators will illuminate until the power-up sequence is complete. After approximately 10 seconds you should see a display on the screen.

Setup/Configure the Monitor

Setting up the monitor requires you to configure the monitor at the Service mode level and at the Boot Loader level.

Choose and program the procedures listed below in the order presented. Each procedure is described on the following pages.

- Set Patient-Monitor Type (Service mode)
- Set Monitor Defaults Password (Service mode)
- Set Unit Name (Service mode)
- Set Bed Number (Service mode)
- Set Country Selection (Boot Loader)
- Set Language (Boot Loader)

NOTE

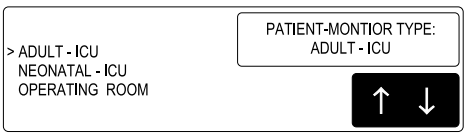
Refer to the operator's manual to configure this monitor for clinical use.

Set Patient-Monitor Type

The Patient-Monitor Type selection determines the type of monitor desired, i.e adult, neonatal or operating room. Different alarms and parameters are activated for each selection. This menu item is part of the SERVICE MODE menu.

Access Patient-Monitor Type option, starting from the Main Menu.

1. Select *MORE MENUS* > *MONITOR SETUP* > *SERVICE MODE*.
2. Enter password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407)
3. Select *PATIENT-MONITOR TYPE*. Be sure to read the information in the Attention box before changing anything.



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4. Rotate **Trim Knob** control to select the type of environment the monitor will be used in.
5. Press **Trim Knob** control to exit. Your selection displays at the top of the screen after the time.

Set Monitor Defaults Password

The Monitor Defaults Password selection allows you to specify whether or not a password is required to change the monitor's defaults.

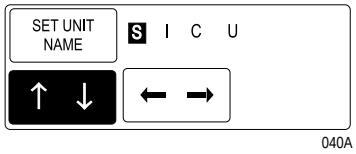
1. Access Monitor Defaults Password option, starting from the Main Menu.
2. Select *MORE MENUS > MONITOR SETUP > SERVICE MODE.*
3. Enter password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407)
4. Select *MENU SETUP > MONITOR DEFAULTS PASSWD.*
5. Use the **Trim Knob** control to select either *REQUIRED* or *NOT REQUIRED.*
6. Press **Trim Knob** control to exit.

Set Unit Name

Up to seven characters are used to identify the care unit. These characters display at the top right of the screen immediately preceding the bed number.

Access Set Unit Name option, starting from the Main Menu.

1. Select *MORE MENUS > MONITOR SETUP > SERVICE MODE.*
2. Enter password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407)
3. Select *MONITOR SETTINGS > UNIT NAME.*



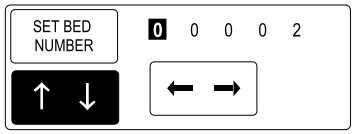
4. Use the **Trim Knob** control to select and change each character. Up to seven characters may be entered.
5. Select *SET UNIT NAME* and press the **Trim Knob** control to exit.

Set Bed Number

The bed number identifies a particular patient bed. Up to five characters are used to identify bed number. This number displays at the top right of the screen.

Access Set Bed Number option, starting from the Main Menu.

1. Select *MORE MENUS* > *MONITOR SETUP* > *SERVICE MODE*.
2. Enter password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407)
3. Select *MONITOR SETTINGS* > *UNIT NAME* > *SET BED NUMBER*.



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4. Use the **Trim Knob** control to select and change each character. Up to five characters may be entered.
5. Select *SET BED NUMBER* and press the **Trim Knob** control to exit.

Set Country Selection

Select *DEFAULT* or *FRANCE* to choose a particular set of GE factory defaults.

1. Activate the Boot Loader program.
   a. Hold down **NBP GO/STOP** and **ZERO ALL**.
   b. Press and release the **Trim Knob** control.
   c. Keep holding **NBP GO/STOP** and **ZERO ALL** until the Boot Code information appears on the display.
2. Select *SET CONFIGURATION* menu option.
3. In the Configuration Menu, select *Country Selection* and choose the country.

Set Language

Select *Set Language* to change the language of the displayed text.

1. Activate the Boot Loader program.
   a. Hold down **NBP GO/STOP** and **ZERO ALL**.
   b. Press and release the **Trim Knob** control.
   c. Keep holding **NBP GO/STOP** and **ZERO ALL** until the Boot Code information appears on the display.
2. Select the *SERVICE MENU*.
3. Select the *SET CONFIGURATION* menu option.
4. Select the *SET LANGUAGE* menu option.
5. Select the appropriate language.
6. Manually reboot the monitor to display the new language.
   a. Hold down **NBP GO/STOP** and **ZERO ALL**.
   b. Press and release the **Trim Knob** control.
   a. Release **NBP GO/STOP** and **ZERO ALL**.

Completion

The monitor is now ready for normal operation. At this time, perform the "Checkout Procedure" on page 4-24.

Installing Software

The monitor leaves the factory with software installed. If you need to re-install software at any time, see the Transport Pro Patient Monitor Software Installation Instructions. These instructions are provided with the software Installation CD ROM.

4 Maintenance

For your notes

Maintenance Schedule

Manufacturer Recommendations

To make sure the monitor remains in proper operational and functional order, qualified service personnel should perform the following regular maintenance.

- Visual Inspection — Perform a visual inspection upon receipt of the equipment, every 12 months thereafter, and prior to servicing the unit.
- Cleaning — Clean the unit upon receipt of the equipment, every 12 months thereafter, and each time the unit is serviced.
- Conditioning the Batteries — Condition the batteries once every six months or as needed.
- Electrical Safety Tests — Perform safety tests upon receipt of the equipment, every 12 months thereafter, and each time the unit is serviced.
- Checkout Procedures — Perform the checkout procedures upon receipt of the equipment, every 12 months thereafter, and each time the unit is serviced.

Manufacturer Responsibility

WARNING
Failure on the part of all responsible individuals, hospitals or institutions, employing the use of this device, to implement the recommended maintenance schedule may cause equipment failure and possible health hazards. The manufacturer does not, in any manner, assume the responsibility for performing the recommended maintenance schedule, unless an Equipment Maintenance Agreement exists. The sole responsibility rests with the individuals, hospitals, or institutions utilizing the device.

Visual Inspection

The monitor and its components should be carefully inspected prior to installation, once every 12 months thereafter and each time the equipment is serviced.

- Carefully inspect the equipment for physical damage to the case, the display screen, and the keypad. Do not use the monitor if damage is determined. Refer damaged equipment to qualified service personnel.
- Inspect all external connections for loose connectors or frayed cables. Have any damaged connectors or cables replaced by qualified service personnel.
- Inspect the display face for marks, scratches, or other damage. Have the LCD replaced by qualified service personnel if necessary.
- Safety labels and inscription on the device are clearly legible.

Cleaning

Cleaning Precautions

Use one of the following approved solutions:

- Cidex solution, or
- Sodium hypochlorite bleach (diluted), or
- Mild soap (diluted)
- Lint-free cloth
- Dust Remover (compressed air)

To avoid damage to the equipment surfaces, *never* use the following cleaning agents:

- organic solvents,
- ammonia based solutions,
- acetone solution,
- alcohol based cleaning agents,
- Betadine solution,
- a wax containing a cleaning substance, or
- abrasive cleaning agents.

Exterior Cleaning

Clean the exterior surfaces with a clean, lint-free cloth and one of the cleaning solutions listed in the table above.

- Wring the excess solution from the cloth. Do not drip any liquid into open vents, switches, plugs, or connectors.
- Dry the surfaces with a clean cloth or paper towel.

Cleaning the Display

In general you will need to use a soft, clean, lint-free cloth dampened with a glass cleaner.

CAUTION
To avoid getting liquid into connector openings, do not spray glass cleaning or general cleaning solutions directly onto the product's surface.

Lithium-Ion Battery

The Lithium-Ion battery is a rechargeable battery containing Lithium-Ion cells. Each battery contains an integrated electronic fuel gauge and a safety protection circuit. The battery communicates with the Transport Pro monitor and the battery charger via the SMBUS 2-wire serial interface.

The Impact of Lithium-Ion Battery Technology on the Battery

The following are the key points you should know about Lithium-Ion battery technology:

- The battery will discharge on its own, even when it is not installed in a monitor. This discharge is the result of the Lithium-Ion cells and the bias current required for the integrated electronics.
- By the nature of Lithium-Ion cells, the battery will self-discharge. The self-discharge rate doubles for every 10°C (18°F) rise in temperature.
- The capacity loss of the battery degrades significantly at higher temperatures.
- As the battery ages, the full-charge capacity of the battery will degrade and be permanently lost. As a result, the amount of charge that is stored and available for use is reduced.

How to Improve the Performance of the Battery

Installation Guideline

Position the monitor in a location that does not artificially increase the operating temperature of the battery. See "Location" on page 3-3 for monitor installation requirements.

Charging Guideline

Use the Cadex SMart Two+ charger to charge the battery instead of charging the battery inside the monitor.

- The Cadex SMart Two+ charger maintains a lower battery cell temperature during the charge cycle than the monitor. This reduction in temperature will extend the life of the battery.

Conditioning Guideline

Remove the battery from the monitor every six months and condition it using the Cadex SMart Two+ charger.

- This condition cycle recalibrates the electronic fuel gauge.

Storage Guideline

Store the battery outside of the monitor at a temperature between 20°C to 25°C (68°F to 77°F).

- When the battery is stored inside a monitor that is powered by an AC power source, the battery cell temperature increases by 10°C to 15°C (50°F to 59°F) above the room's ambient temperature. This reduces the life of the battery.
- When the battery is stored inside a monitor that is continuously powered by an AC power source and is not powered by battery on a regular basis, the life of the battery may be less than 12 months. GE recommends that you remove the battery and store it near the monitor until it is needed for transport.

How to Identify the Capacity of the Battery

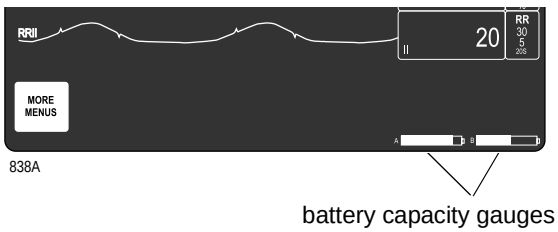
Battery Capacity Definitions

The following terms are used to define the capacity of the battery:

- Design Capacity — The theoretical capacity of the battery cells when the battery is new.
- Full Charge Capacity — The actual amount of charge the battery can store and deliver to the monitor.
- Remaining Charge Capacity — The amount of Full Charge Capacity currently remaining in the battery. This is a percent of Full Charge Capacity.

Identifying Capacity or Battery Run Time Using the Monitor

One new, fully charged battery lasts about 2 hours. Two new, fully charged batteries last about 4 hours. The battery capacity gauge icon located in the lower right-hand corner of the display is the battery's "fuel gauge." This gauge identifies the battery's current state of health and charge status.

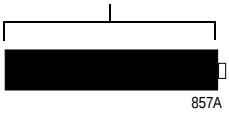


A battery that has 100% Design Capacity and is charged to 100% of this capacity, lasts approximately 2 hours. However, as the Full Charge Capacity declines, the approximate run time of a fully charged battery will decrease.

Single Battery Run Time: Approximately 2.0 Hours

An icon fully outlined with solid lines and completely filled indicates a new battery, fully charged to a minimum of the battery's Design Capacity.

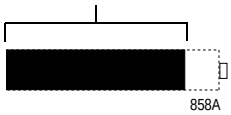
Design Capacity and Full Charge Capacity



Single Battery Run Time: Approximately 1.5 Hours

The dotted portion of the icon outline shows that the battery has lost 20% of its Design Capacity. The solid-outline portion is filled in, showing that the battery is charged to 100% Full Charge Capacity.

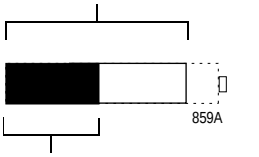
Full Charge Capacity



Single Battery Run Time: Approximately 0.8 Hours

The dotted portion of the icon outline shows that the battery has lost 20% of its Design Capacity. The solid-outline portion is half filled in, showing that the battery is charged to only 50% of available capacity.

Full Charge Capacity



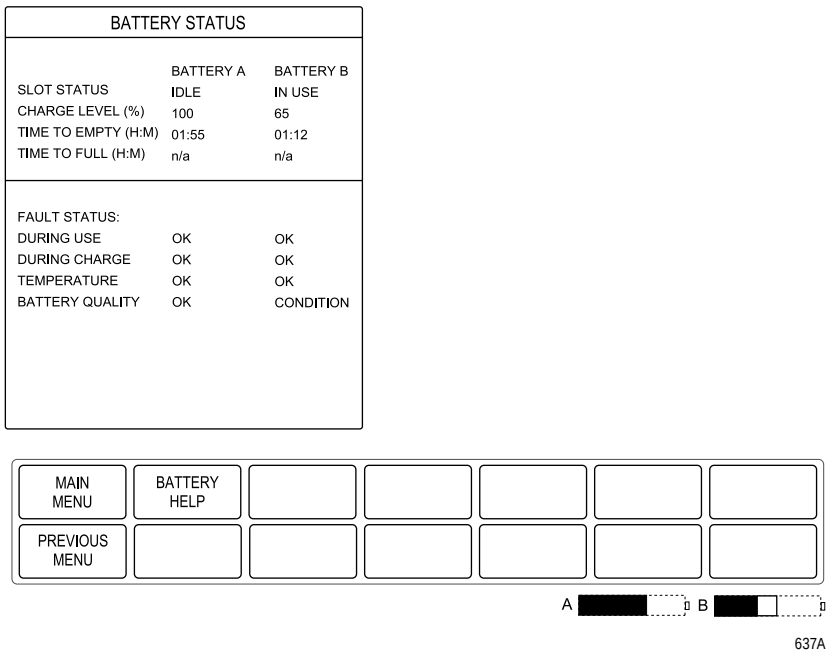
Identifying Battery Capacity Using the Cadex SMart Two+ Charger

When you select the **Target Capacity** switch on the charger, the charger compares the battery's performance to a 60%, 70%, or 80% target capacity set on the battery charger. If the battery fails to meet the target performance, the battery charger will prompt you to condition the battery. If after the condition cycle has been completed, the battery does meet the target performance, then the battery charger will illuminate a "fail" light. Or, if the battery is not performing to the target capacity, the battery charger will illuminate a "fail" light.

Accessing Additional Battery Information Via the Battery Status Window

To display detailed battery information, access the monitor's Battery Status window.

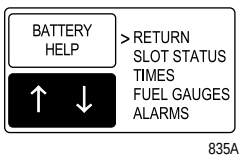
1. Select *MORE MENUS* from the Main Menu.
2. Select *BATTERY STATUS* to display the Battery Status menu and information window.



- If a battery is not present, a *NO BATT* message is displayed in this column.
- If the battery is *NO COMM* (communication with this battery has failed), "unknown" is displayed for all rows except the *SLOT STATUS* row.

Battery Help Menu

This menu option opens a popup menu. Selecting one of the options in the popup menu opens an information window that provides help material for that option.



The menu options are:

- *RETURN* — Returns to the Battery Status menu.
- *SLOT STATUS* — Provides definitions of the battery conditions.
  - *No Battery* — No battery is installed in this slot.
  - *Initializing* — Battery is just installed, establishing

communication.

- *No Comm* — Communication with this battery has failed because it is either sleeping, defective, or not a SMart Battery.
- *Incompatible* — The battery is not compatible with this monitor's battery management system.
- *Fail* — See message displayed in the lower half of the display.
- *In Use* — This battery is currently powering the monitor.
- *Full* — Fully charged.
- *Charging* — Currently being charged.
- *Idle* — Not currently in use or charging.

- *TIMES* — Defines "time to empty" and "time to full."
  - Time to Empty — The time to empty represents an estimate of how much longer the monitor will be able to run with the current monitored parameters. This value is only displayed when the monitor is powered by battery.
  - Time to Full — The time to full represents an estimate of the time remaining before this battery is fully charged. Total recharge time for this unit is the sum of both batteries' time to full.
- *FUEL GAUGES* — Explains the battery capacity gauges.

  The fuel gauge is filled from the left to right proportional with the battery's charge level. The full rated capacity of a new battery of this type is represented by a dashed outline. The maximum charge level for the battery currently installed is represented by a solid outline. As a battery ages, its maximum charge level becomes a smaller percentage of its Design Capacity. The solid portion represents the current charge level of the battery as a percentage of its maximum Full Charge Capacity.
- *ALARMS* — Explains low battery and battery fault alarms and messages.
  - Fault Status Messages — General, charging, and temperature failures indicate that the battery has failed, or the charging of the battery has failed. Replace it with a different battery.
  - Condition — Condition this battery using an external battery charger.
  - Low Battery Alarms — The monitor will issue a System Warning alarm when there is approximately 10 minutes per battery run time remaining. The monitor will issue a System Warning alarm when shutdown is imminent (less than one minute left of remaining run time).

How to Replace the Battery

1. Open the battery door by gently pulling on the battery door pull tab.

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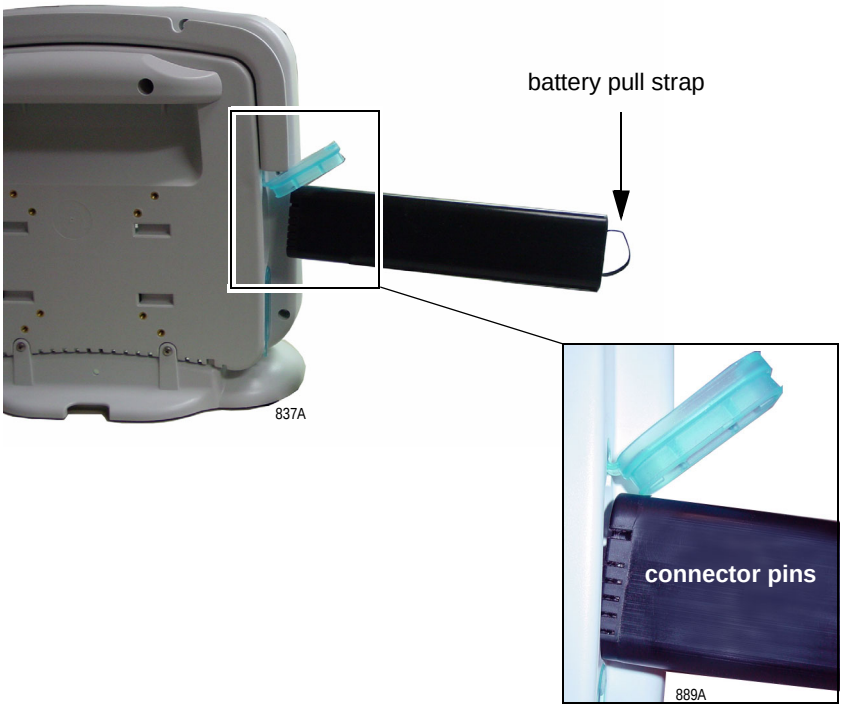
2. Pull on the battery pull strap to remove the battery from the monitor.



3. Insert the new battery.
   a. Insert the connector end of the battery into the battery slot. Verify the connector ends are facing the back of the monitor.
   b. Push the battery firmly into the slot.
4. Gently push the battery door closed until it “snaps” into position.

   NOTE
   The battery door will not close if the battery is not fully inserted into the battery slot.

5. Verify that the monitor operates correctly.
   a. Confirm that the battery icon is displayed in the lower right corner of the monitor.
   b. Verify the green or amber battery **CHARGING STATUS** LED is illuminated.

How to Charge the Battery

The battery can be charged by one of two methods:

- Outside of a monitor by using the Cadex SMart Two+ charger.
- Inside a monitor that is connected to an AC power source.

NOTE

To extend the life of the battery, GE recommends that you charge the battery using the external Cadex SMart Two+ charger.

Charging the Battery With a Cadex SMart Two+ Charger

1. Insert the battery into the battery charger. The **RUN** LED illuminates.
2. Leave the battery in the battery charger until the **READY** LED illuminates.

NOTE

If the **FAIL** LED illuminates, remove the battery from the battery charger and reinsert it. This will correct any battery charger time out errors.

Charging the Battery Inside a Monitor

The battery is charged whenever the monitor is connected to an AC power source.

When you store the battery inside of a monitor that is connected to an AC power source (a state known as “floating”), the battery will self-discharge to less than 90% of its Full Charge Capacity after approximately two weeks (depending upon the temperature of the battery). At this time, the monitor will automatically recharge the battery to 100% of its Full Charge Capacity.

How to Condition the Battery

The battery can be conditioned by one of two methods:

- Outside of a monitor by using the Cadex SMart Two+ charger.
- Inside a monitor that is connected to an AC power source.

NOTE

To extend the life of the battery, GE recommends that you condition the battery using the external Cadex SMart Two+ charger.

Conditioning the Battery With a Cadex SMart Two+ Charger

A conditioning cycle using the battery charger requires approximately nine hours to complete. Complete the following steps to automatically condition the battery.

1. Insert the battery into the battery charger.
2. Press the **Condition** button when one of the following conditions occur:
   - While the **RUN** LED light is still flashing.
   - While the **Condition** LED is flashing.
3. Remove the battery from the battery charger when the **RUN** LED illuminates. This completes the conditioning cycle.

Conditioning the Battery Inside a Monitor

WARNING

PATIENT RISK HAZARD — Never condition a battery while the monitor is connected to a patient. Serious injury or death could result.

Complete the following steps to manually condition the battery using the monitor:

1. Remove all batteries from the monitor.
2. Insert one battery into Slot A of the monitor.
3. Disconnect the monitor from the AC power source.
4. Access the monitor's Battery Status window to monitor the battery's Charge Level. See "Accessing Additional Battery Information Via the Battery Status Window" on page 4-9.
5. Allow the battery to discharge to less than a 90% Charge Level.
6. Re-connect the monitor to the AC power source and fully charge the battery.

7. Disconnect the monitor from the AC power source and allow the monitor to run until it displays the *BATTERY LOW* message, or until the monitor shuts down.
8. Re-connect the monitor to the AC power source. Allow the battery to fully charge to complete the conditioning cycle.

How to Store the Battery

See "Storage Guideline" on page 4-7.

How to Wake Up the Battery

When the battery is stored for a long period of time without being charged, it will eventually lose all of its charge and "fall asleep." When the battery is "asleep," none the LEDs on the battery will illuminate when the battery's on/off button is pressed. You must "wake up" the battery before you can use it again.

There are two methods to wake up the battery:

- Outside of a monitor by using the Cadex SMart Two+ charger.
- Inside a monitor that is connected to an AC power source.

Waking Up the Battery With a Cadex SMart Two+ Charger

NOTE
A deep discharged battery will require you to repeat the following steps more than once before the battery will "wake up."

1. Insert the battery into the battery charger and wait for the **RUN** LED light to illuminate (approximately three minutes).
2. If the **RUN** LED light does NOT illuminate, complete the following steps:
   a. Remove the battery from the battery charger.
   b. Re-insert the battery into the battery charger and let the battery charge for two to three minutes while the **FAIL** LED flashes. (If the **RUN** LED light illuminates, ignore it.)
   c. Watch the battery charger LEDs and immediately remove the battery from the battery charger when the **FAIL** LED stops flashing AND remains illuminated, OR when both the **RUN** and **CONDITION** LEDs flash.
   d. Wait for one to two seconds, then re-insert the battery into the battery charger. The **RUN** and **CONDITION** LEDs will flash for five to ten seconds while the charger initializes the battery. If the **FAIL** LED illuminates, remove the battery and re-insert it into the battery charger.
   e. Watch the battery charger LEDs. The **RUN** LED should stop flashing and remain illuminated for approximately one minute later the **CONDITION** LED should stop flashing. At this time, the battery is awake and being charged.

Waking Up the Battery With a Monitor

1. Connect the monitor to an AC power source.
2. Activate the Boot Loader program.
   a. Hold down **NBP GO/STOP** and **ZERO ALL**.
   b. Press and release the **Trim Knob** control.
   c. Keep holding **NBP GO/STOP** and **ZERO ALL** until the Boot Code information appears on the display.
3. Select *Wake Up Battery* from the Service Menu.
4. Insert the "sleeping" battery into Slot A of the monitor.
5. Select *Wake Up Lithium Ion Battery in SLOT A*. Then, the monitor applies a "wake-up" shot of current for up to 210 seconds.
6. Watch for the message, *Battery awake, run main code to charge*. The battery should now be "awake."
   - If the "*Battery awake, run main code to charge*" message appears but the battery is NOT awake, the battery may be in a deep discharge state. You should repeat step 5 at least four more times to give the battery additional "wake-up" shots of current.
7. Quickly reboot the monitor to begin charging the batteries. The monitor's illuminated yellow-colored **CHARGING STATUS** LED indicates that the battery is being charged.

NOTE
The monitor will not charge the battery while it is running the Boot Loader program.

How to Recycle the Battery

When the battery no longer holds a charge, it should be replaced. The battery is recycleable. Remove the old battery from the monitor and follow your local recycling guidelines.

WARNING
EXPLOSION HAZARD — DO NOT incinerate the battery or store at high temperatures. Serious injury or death could result.

Rechargeable Battery Collection Sites

In the United States and Canada, the Rechargeable Battery Recycling Corporation (RBRC) can help you locate your nearest rechargeable battery collection site. You can contact RBRC by telephone or by accessing their internet web site.

- telephone: 1-800-8-BATTERY (800-822-8839)
- internet address: www.rbrc.org

The Cadex SMart Two+ Charger

Battery Charger LED Indicators

The following is a quick guide which identifies the meaning of the charger LEDs.

LED Indicators	Illuminated	Flashing
RUN	Charging in progress.	Initializing the battery.
RUN and CONDITION	Conditioning in progress.	
READY	Charging is complete.	
READY and CONDITION	Conditioning is complete — pass target.	Conditioning is required.
FAIL	Battery fault.	Charger fault.
FAIL and CONDITION	Conditioning is complete — fail target.	

Battery Charger Software Requirements

The batteries used in this monitor require Cadex SMart Two+ Charger software version 1.1 or later.

Electrical Safety Tests

General

Electrical safety tests provide a method of determining if potential electrical health hazards to the patient or operator of the device exist.

Recommendations

GE recommends that you perform all safety tests presented in this chapter.

- upon receipt of the device (monitor and its associated equipment),
- every twelve months thereafter,
- each time the main enclosure is disassembled or a circuit board is removed, tested, repaired, or replaced, and
- record the date and results on the “Maintenance/Repair Log” included at the end of this chapter.

These instructions are intended for every component in the system. If the Tram-rac housing does not have its own power supply, it should remain connected to the monitor throughout the safety tests.

WARNING
Failure to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazards. Unless you have an Equipment Maintenance Contract, GE does not in any manner assume the responsibility for performing the recommended maintenance procedures. The sole responsibility rests with the individual or institution using the equipment. GE service personnel may, at their discretion, follow the procedures provided in this manual as a guide during visits to the equipment site.

Test Conditions

Electrical safety tests may be performed under normal ambient conditions of temperature, humidity, and pressure.

The device under test includes the monitor and the optional external power supply.

Test Equipment

The recommended test equipment required to perform electrical safety tests is listed below.

Item	Specification
Leakage Current Tester	Equivalent to the circuits shown
Digital Multimeter (DMM)	AC volts, ohms
Ground Bond Tester	0 – 1 ohm
ECG Test Body	All leads together
External power supply for the monitor	PN 2012183-001

Power Outlet Test

NOTE

The device under test includes the monitor and the optional external power supply.

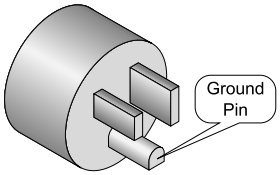
Before starting the tests, the power outlet from which the monitoring device will get electrical power must be checked. This test checks the condition of the power outlet to ensure correct results from leakage tests.

For international power outlets, refer to the internal standards agencies of that particular country. Use a digital multimeter to ensure the power outlet is wired properly.

If other than normal polarity and ground is indicated, corrective action must be taken before proceeding. The results of the following tests will be meaningless unless a properly wired power outlet is used.

Ground (Earth) Integrity

Listed below are two methods for checking the ground (earth) integrity, “Ground Continuity Test” and “Impedance of Protective Earth Connection.” These tests determine whether the device's exposed metal and power inlet's earth (ground) connection has a power ground fault condition.



Perform the test method below that is required by your Country/Local governing safety organization.

NOTE

The device under test includes the monitor and the optional external power supply.

Ground Continuity Test

Completion of this test is checked by the following steps:

1. Disconnect the device under test from the power outlet.
2. Connect the negative (-) lead of the DMM to the protective earth terminal (ground pin in power inlet connector) or the protective earth pin in the Mains plug (ground pin in power cord). Refer to the US 120Vac power cord figure above.
3. Set the DMM to the milliohm (mΩ) range.
4. Connect the positive (+) lead of the DMM to the grounding tabs on the Video In connector.
5. Resistance must read:
   - 0.1 ohm or less without power cord
   - 0.2 ohms or less with power cord

Impedance of Protective Earth Connection

This test unlike a ground continuity test will also stress the ground system by using special ground bond testers.

This test normally is only required as a manufacturing production test to receive safety agency compliance (i.e. IEC601-1).

Some country agency's do require this test after field equipment repairs (i.e. Germany's DIN VDE 0751 standards).

Consult your country/local safety agency if in question.

Compliance is checked by the following steps:

1. A current not less than 10A and not exceeding 25A from a current source with a frequency of 50 or 60 Hz with a no-load voltage not exceeding 6 V is passed for at least 5 s through the protective earth terminal or the protective earth pin in the mains plug and the ground tabs of the Video In connector which could become live in case of failure in basic insulation.
2. The voltage drop between the parts described is measured and the impedance determined from the current and voltage drop. It shall not exceed the values indicated.

For equipment without a power supply cord the impedance between the protective earth terminal and the ground tabs of the Video In connector which is protectively earthed shall not exceed 0.1 ohms

For equipment with a power supply cord the impedance between the protective earth pin in the mains plug and the ground tabs of the Video In connector which is protectively earthed shall not exceed 0.2 ohms.

When taking this measurement, move the unit's power cord around. There should be no fluctuations in resistance.

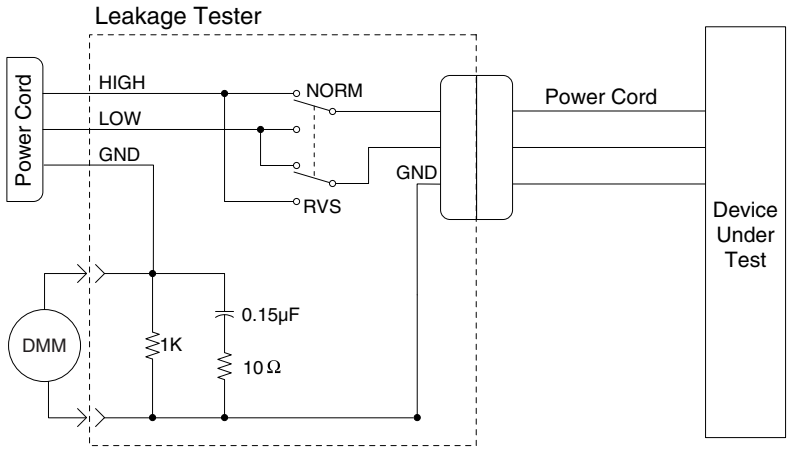
Ground (Earth) Wire Leakage Current Tests

Perform this test to measure current leakage through the ground (earth) wire of the equipment during normal operation.

NOTE

The device under test includes the monitor and the optional external power supply.

1. Configure the leakage tester like the circuit shown below.



DMM set to measure AC voltage

2. Connect the power cord of the device under test to the power receptacle on the leakage tester.
3. The device under test is to be tested at its normal operating voltage.
4. Set the power switch of the device under test to ON.
5. Read the current leakage indicated on DMM.
6. Set the polarity switch on the leakage tester to RVS (reverse).
7. Read the current leakage indicated on DMM.

NOTE

If either reading is greater than the appropriate specification below, the device under test fails. Contact GE Medical Systems *Information Technologies* Technical Support.

- 300 µA (0.3 volts on the DMM), and the device under test is powered from 100-120 V/50-60 Hz
- 300 µA (0.3 volts on the DMM), and the device under test is powered from a centered-tapped 200-240 V/50-60 Hz, single phase circuit
- 500 µA (0.5 volts on the DMM), and the device under test is powered from a non-center-tapped, 200-240 V/50-60 Hz, single-phase circuit

NOTE

Center-tapped and non-center-tapped supply circuits produce different leakage currents and the UL and IEC limits are different.

8. Set the power switch of the device under test to OFF.

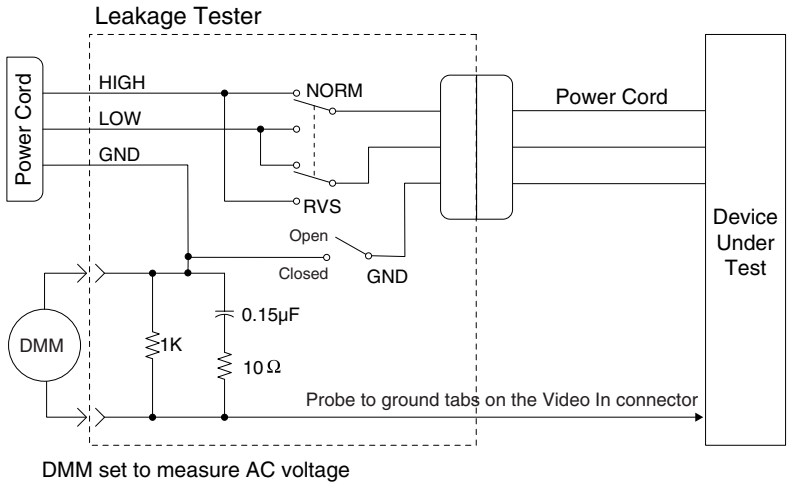
Enclosure Leakage Current Test

Perform this test to measure current leakage through the ground tabs on the Video In connector on the device under test during normal operation.

NOTE

The device under test includes the monitor and the optional external power supply.

1. Configure the leakage tester like the circuit shown below with GND switch OPEN and polarity switch NORM.



DMM set to measure AC voltage

2. Connect probe to the ground tabs on the Video In connector.
3. Set the power switch of the device to ON.
4. Read the current leakage indicated on DMM.

NOTE

Center-tapped and non-center-tapped supply circuits produce different leakage currents and the UL and IEC limits are different.

5. Set the polarity switch to RVS.
6. Read the current leakage indicated on DMM.

NOTE

If either reading is greater than the appropriate specification below, the device under test fails. Contact GE Medical Systems *Information Technologies* Technical Support.

- 300 µA (0.3 volts on the DMM), and the device under test is powered from 100-120 V/50-60 Hz
- 300 µA (0.3 volts on the DMM), and the device under test is powered from a centered-tapped 200-240 V/50-60 Hz, single phase circuit
- 500 µA (0.5 volts on the DMM), and the device under test is powered from a non-center-tapped, 200-240 V/50-60 Hz, single-phase circuit

7. Set the GND switch on the leakage tester to CLOSED.

8. Read the current leakage indicated on DMM.
9. Set the polarity switch to RVS.
10. Read the current leakage indicated on DMM.

NOTE

If the reading is greater than the specification below, and the device under test is powered from 100-240 V/50-60 Hz, the device under test fails. Contact GE Medical Systems *Information Technologies* Technical Support.

- 100 microamperes (0.1 volts on the DMM), and the device under test is powered from 100-240 V/50-60 Hz

11. Set the power switch of the device under test to OFF.

Test Completion

1. Disconnect the leakage tester from the power outlet.
2. Disconnect all test equipment from the device.
3. Disconnect the device power cord from the leakage tester.

Checkout Procedure

General

This procedure tests the functions of the monitor. For the Tram module and input module checkout procedures, refer to their appropriate service manuals.

Required Tools/Special Equipment

See the chart below for the equipment necessary to perform this checkout procedure. Equivalent equipment may be substituted.

Item	Manufacturer and Part Number/Model
Tram 100-851N module	GE Medical Systems *Information Technologies*; any model
Multifunctional Micro-simulator	MARQ-1
Oscilloscope	Tektronix 2215
External power supply for the monitor	PN 2012183-001
Known good battery	PN 419068-004

Monitor Power-up Tests

1. Remove all batteries and unplug the monitor from the AC power source to turn the monitor off.
2. Restore the batteries to the monitor and plug the monitor into the AC power source to turn the monitor on.
3. Verify the monitor turns on and verify the DC power indicator is illuminated.
4. Verify all of the front panel indicators illuminate on power up.
5. Verify the DC power indicator on the monitor stays illuminated.

   NOTE

   If the DC power indicator stays on, but the screen is blank, the monitor is likely in "standby mode" (battery charging). Press and hold the **POWER** button for approximately 0.25 seconds to enter the normal mode.

   - If the DC power indicator is on, continue with the tests.
   - If either of the **CHARGING STATUS** indicators is yellow, wait for the batteries to fully charge and the indicators to illuminate green. The batteries may require up to four hours to charge.
   - If the battery "fuel gauge" displays the word "ERROR," the battery may be asleep. Refer to "Battery Error Message" on page 5-23.

6. Verify an audio "Beep" tone sounds at the end of Boot up.
7. Verify the operation of the **Trim Knob** control.
   a. Rotate the **Trim Knob** control to scroll through several menus.
   b. Press the **Trim Knob** control on a menu option to verify the menu is selectable.
8. Verify the operation of the control keys.
   - Verify that an audio "Beep" tone sounds after each front panel key is pressed.
9. Check battery power for both batteries.
   a. Unplug the monitor from the AC power source. Verify one LED in the battery compartment is on (batteries must have more than 10% charge).
   b. Pull that battery out and verify the other LED illuminates, thus indicating the unit is powered by the other battery.
   c. Reinstall battery and plug the monitor into an AC power source.

Battery Tests

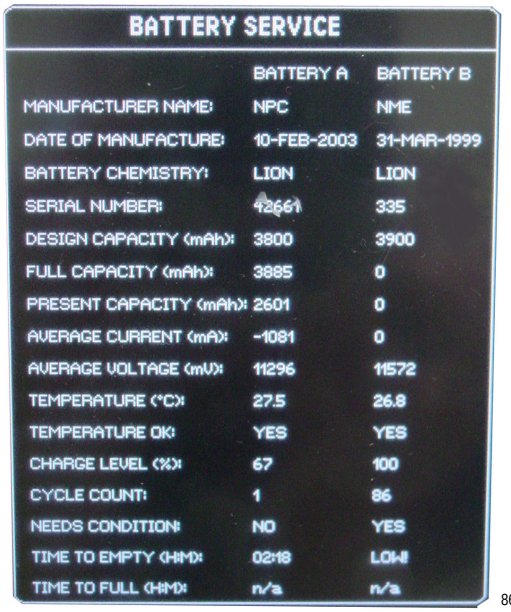
Function Test

1. Disconnect the power cord plug from the electrical power outlet.
2. Verify the **BATTERY** power indicator illuminates. This indicates operation from the monitor's battery power.
3. Insert a Tram module into the Tram chute.
4. Connect the Tram communication cable to the Transport Pro monitor and verify an ECG parameter box is displayed on the monitor screen. This indicates the Tram module can be run from battery power.
5. Connect the power cord plug to the electrical power outlet.
6. Verify the DC power indicator illuminates. This indicates the monitor is operating from the AC power source.
7. Verify the **CHARGING STATUS** indicator illuminates for a few minutes.
   - An amber glow indicates the monitor battery is charging.
   - A green glow indicates the monitor batteries are fully charged.

Real-time Battery Status

Use the monitor's Battery Service window to verify the operating condition of the battery.

1. Access the Service Mode menu starting from the Main menu.
   a. Select *MORE MENUS* > *MONITOR SETUP* > *SERVICE MODE*.
   b. Enter the password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407).
2. Select *BATTERY SERVICE* to display the Battery Service window and review the battery data.


BATTERY SERVICE
BATTERY A
BATTERY B
MANUFACTURER NAME: NPC NME
DATE OF MANUFACTURE: 10-FEB-2003 31-MAR-1999
BATTERY CHEMISTRY: LION LION
SERIAL NUMBER: 42661 335
DESIGN CAPACITY (mAh): 3800 3900
FULL CAPACITY (mAh): 3885 0
PRESENT CAPACITY (mAh): 2601 0
AVERAGE CURRENT (mA): -1081 0
AVERAGE VOLTAGE (mV): 11296 11572
TEMPERATURE (°C): 27.5 26.8
TEMPERATURE OK: YES YES
CHARGE LEVEL (%): 67 100
CYCLE COUNT: 1 86
NEEDS CONDITION: NO YES
TIME TO EMPTY (HH:MM): 02:18 LOW!
TIME TO FULL (HH:MM): n/a n/a
861A

3. If necessary, condition the battery. See "How to Condition the Battery" on page 4-13.

Display Tests

Video Test Screens

1. Activate the Boot Loader program as follows:
   a. Hold down **NBP GO/STOP** and **ZERO ALL** on the front panel.
   b. Press and release the **Trim Knob** control.
   c. Keep holding **NBP GO/STOP** and **ZERO ALL** until the Boot Loader information appears on the display.
2. From the Service Menu, select *Video Test Screens*.
3. Select and test each screen:
   - White Screen.
   - Red Screen.
   - Blue Screen.
   - Green Screen.
   - Vertical Bars.
4. Select Exit to exit Video Test Screens.
5. Manually reboot the monitor to exit the Boot Loader program.
   a. Hold down the **NBP GO/STOP** and **ZERO ALL**.
   b. Press and release the **Trim Knob** control.
   c. Release **NBP GO/STOP** and **ZERO ALL**.

Brightness Level Test

1. Select *MORE MENUS > MONITOR SETUP > BRIGHTNESS*.
2. Verify the display brightness changes when setting the brightness level from 100% to 10%. Reset the brightness level to your default setting.

Speaker Test

1. Change the alarm volume of the monitor to 100%.
   - Select *MORE MENUS > ALARM CONTROL > ALARM VOL:* to display the volume settings popup menu.
2. Verify the speaker volume of the monitor changes accordingly.
3. Return the volume of the monitor to the level it was previously set to, before you changed it for this test.

Tram Module Communication Test

Complete the following steps in the order presented. Failure to attain any of the listed results indicates a malfunction.

1. Confirm that all components of the monitoring system are correctly connected as described in Chapter 3, Installation.
2. Connect the Tram module interconnection cable to the Tram module and to the monitor.
3. Place the Tram module into the chute. Verify that the power indicator illuminates.
4. Configure the monitor display with as many waveforms as possible. Refer to the appropriate monitor operator's manual, if necessary.
5. The waveforms should look clean (no noise).

Checkout Procedures Completion

This completes the checkout procedure.

1. Disconnect all test equipment.
2. Return the monitor to service.

PM Form

Due to continuing product innovation and because specifications in this manual are subject to change without notice, a PM form is not included with this manual. For the latest PM form regarding this product, contact GE Service.

If repairs/adjustments were made or any parts replaced, describe this in the area provided on the PM form.

Also include comments regarding any unusual environmental conditions that may affect the operation or reliability of the equipment in the area provided on the PM form.

On the following page a repair log is included for your convenience to record the repair history of this product.

Repair Log

Unit Serial Number:
Institution Name:

Date	Maintenance/Repair	Technician

5 Troubleshooting

For your notes

Required Tools/Special Equipment

- A standard set of hand tools is required for disassembly and assembly.
- Digital Multimeter.
- A known good battery.
- For electrical safety test equipment, see "Test Equipment" on page 4-18.
- For checkout procedure tools and equipment, see "Required Tools/ Special Equipment" on page 4-24.

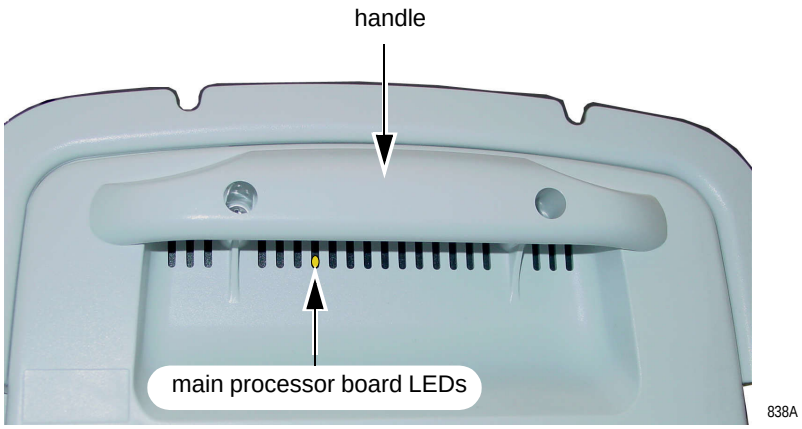
Diagnostic Tests

The following checkout procedures can also be used as diagnostic tests for the monitor:

- "Monitor Power-up Tests" on page 4-25.
- "Battery Tests" on page 4-26.
- "Display Tests" on page 4-28.
- "Speaker Test" on page 4-28.

Main Processor Board LEDs

The Main Processor Board provides three LEDs to help troubleshoot the monitor. When illuminated, these LEDs are viewable from the back plastic vents located underneath the handle.



The following table identifies the meaning of the illuminated LEDs.

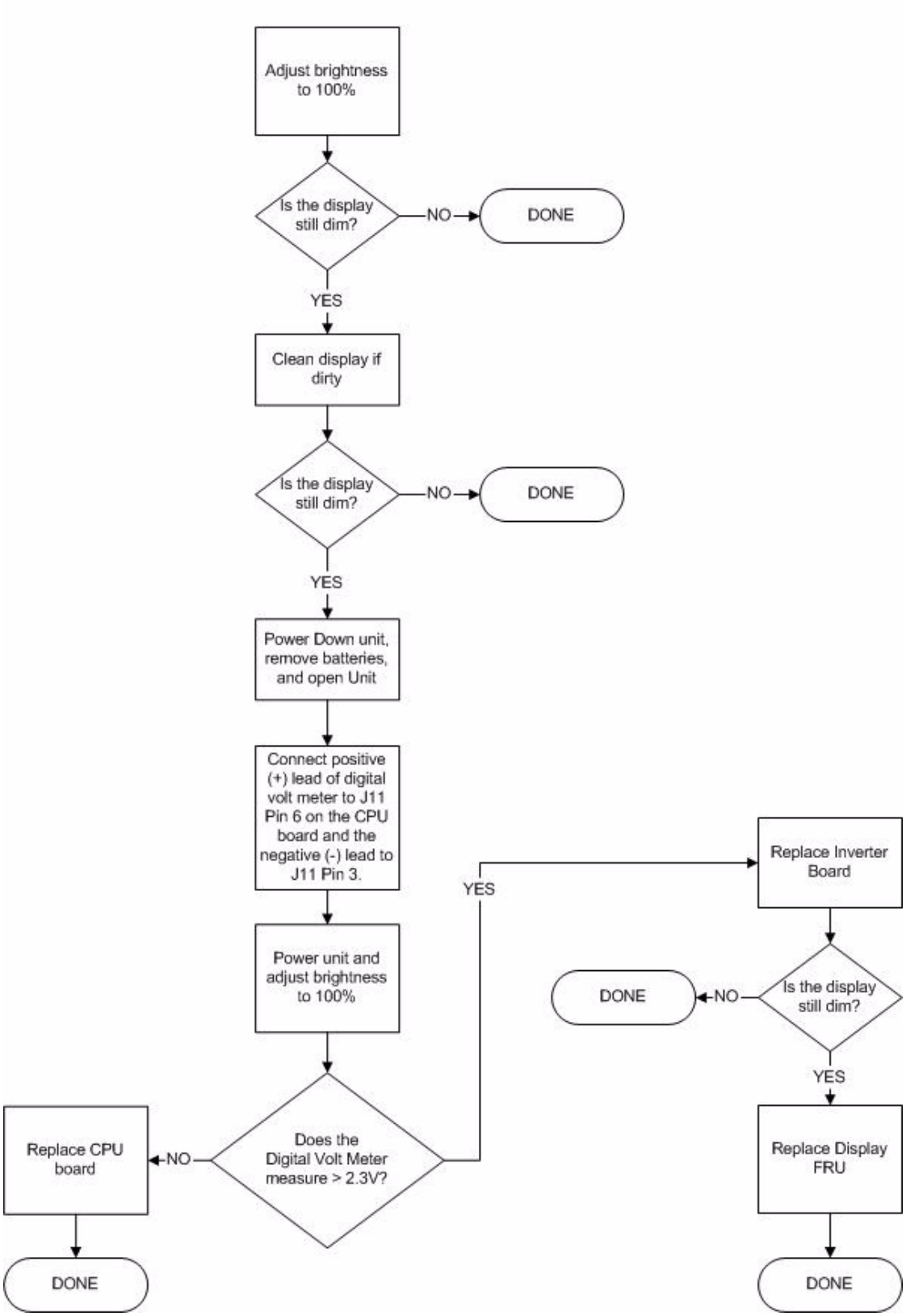
Main Processor Board LEDs	
Color	**Description**
red	The Boot Code has loaded.
yellow	The Main Code has loaded.
green	There is communication with the Tram module.

Troubleshooting Procedures

Symptom: Blank Display

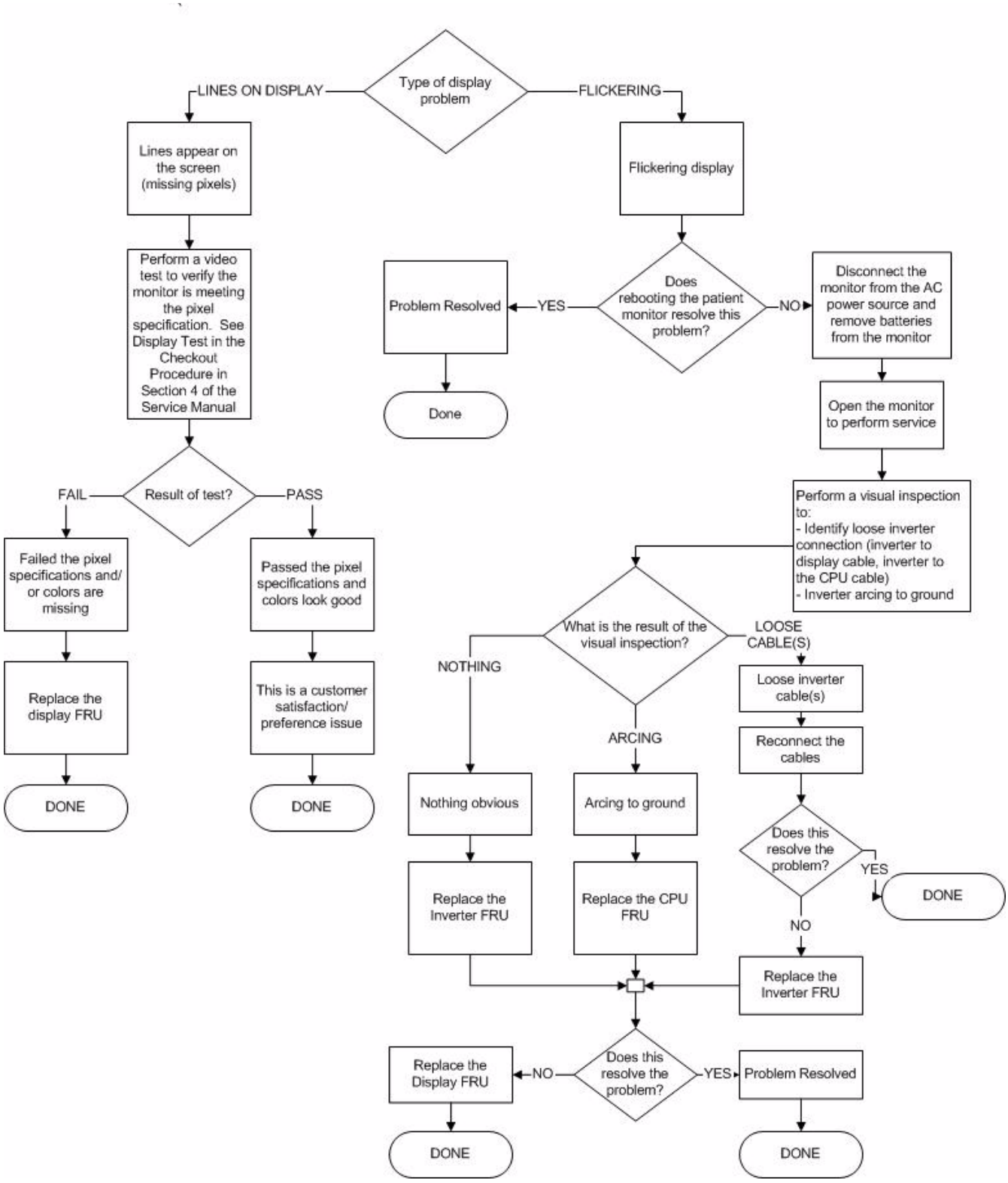
845A

Symptom: Dim Display



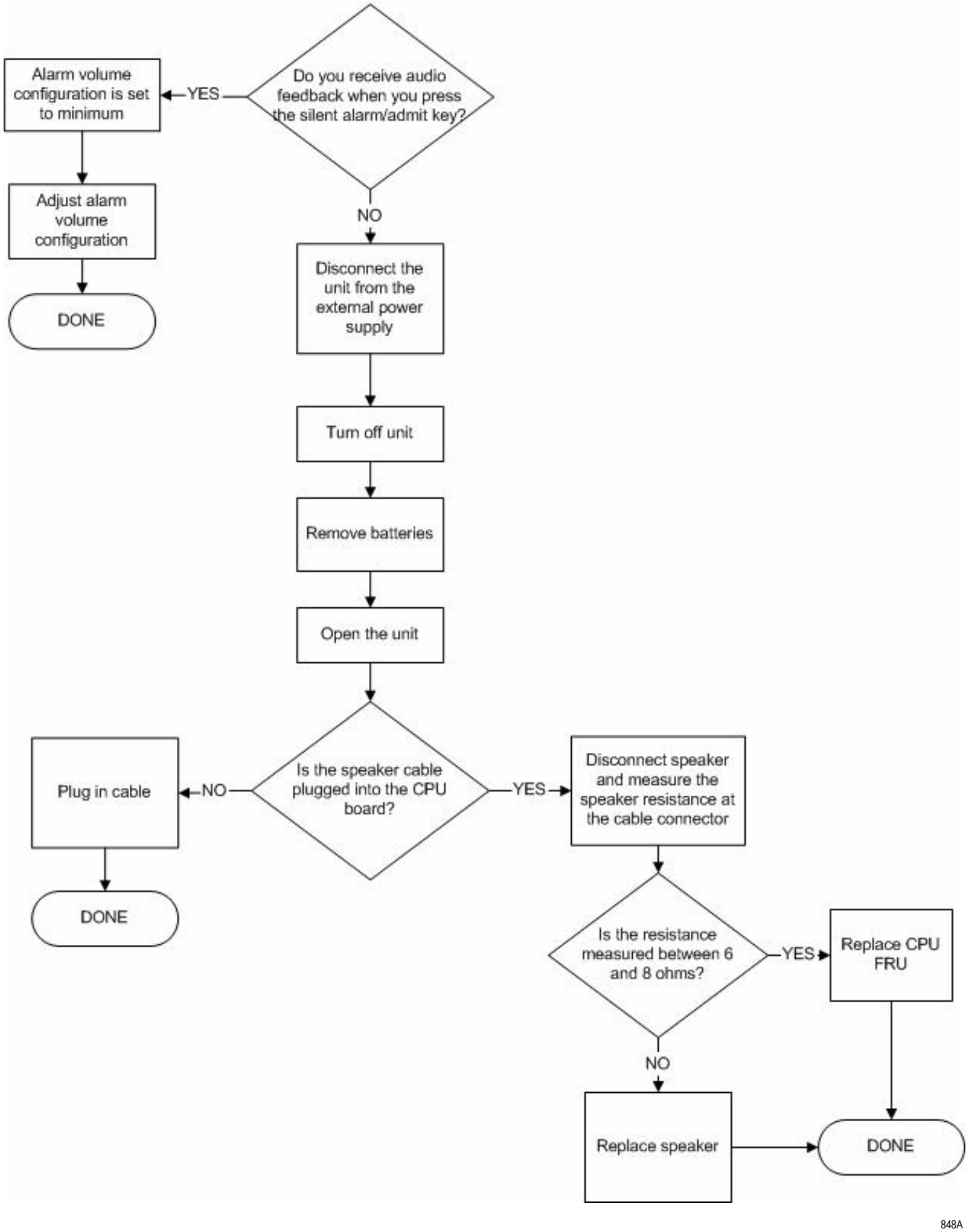
846A

Symptom: Poor Display Quality

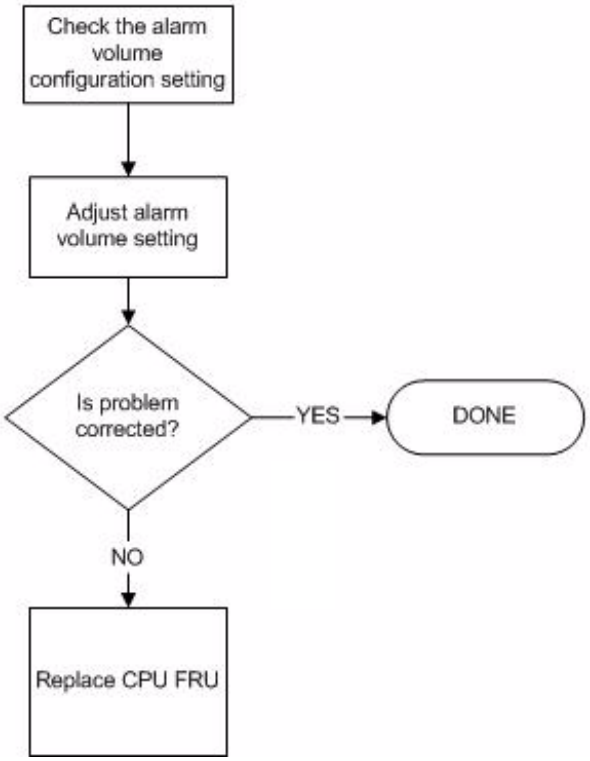

Type of display problem
LINES ON DISPLAY
FLICKERING
Lines appear on the screen (missing pixels)
Perform a video test to verify the monitor is meeting the pixel specification. See Display Test in the Checkout Procedure in Section 4 of the Service Manual
Result of test?
FAIL
PASS
Failed the pixel specifications and/ or colors are missing
Replace the display FRU
DONE
Passed the pixel specifications and colors look good
This is a customer satisfaction/ preference issue
DONE
Flickering display
Does rebooting the patient monitor resolve this problem?
YES
Problem Resolved
Done
NO
Disconnect the monitor from the AC power source and remove batteries from the monitor
Open the monitor to perform service
Perform a visual inspection to:
- Identify loose inverter connection (inverter to display cable, inverter to the CPU cable)
- Inverter arcing to ground
What is the result of the visual inspection?
NOTHING
ARCING
LOOSE CABLE(S)
Nothing obvious
Replace the Inverter FRU
Arcing to ground
Replace the CPU FRU
Loose inverter cable(s)
Reconnect the cables
Does this resolve the problem?
YES
DONE
NO
Replace the Inverter FRU
Does this resolve the problem?
NO
Replace the Display FRU
DONE
YES
Problem Resolved
DONE

847A

Symptom: No Audible Alarms

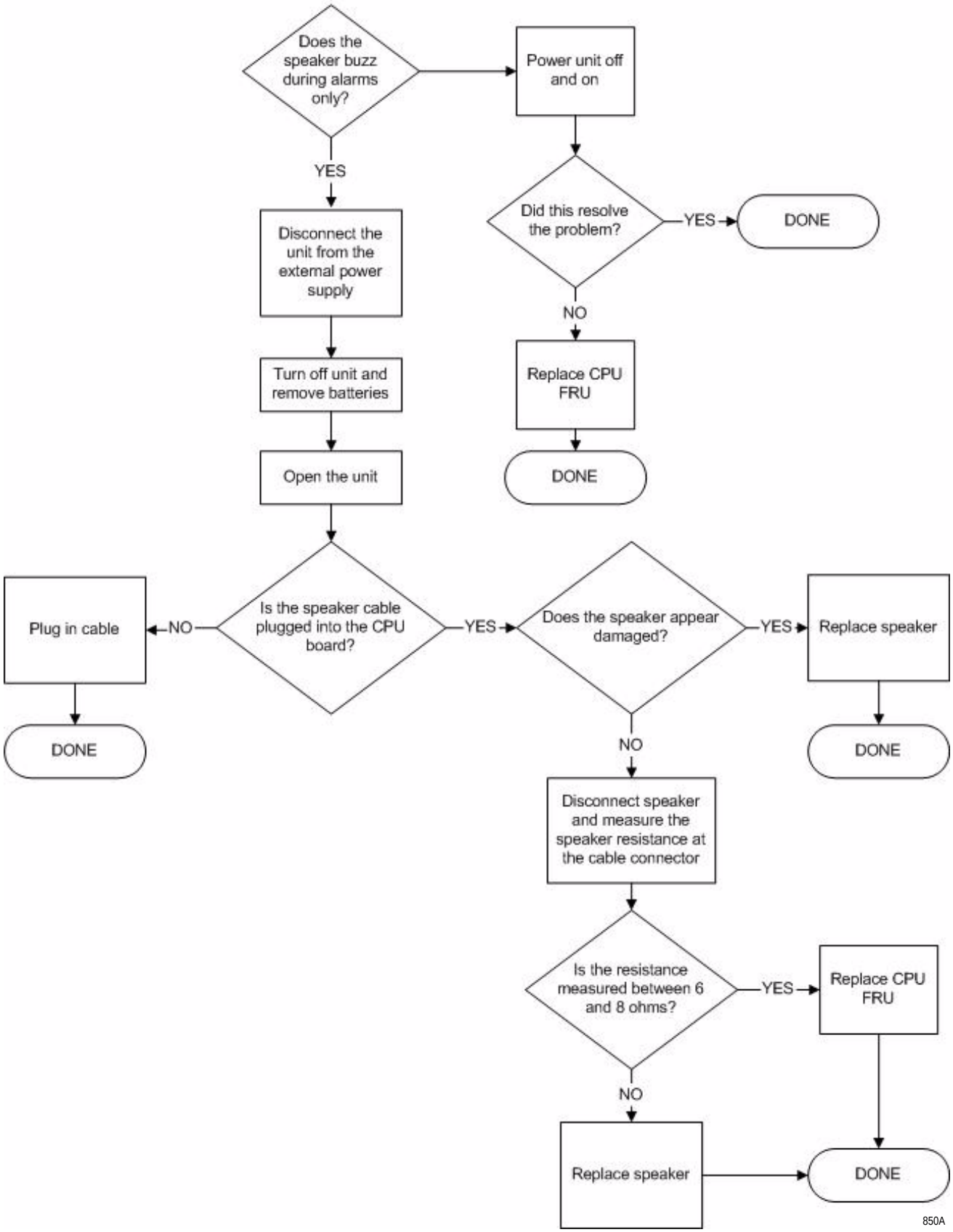


Symptom: Unable to Lower Alarm Volume

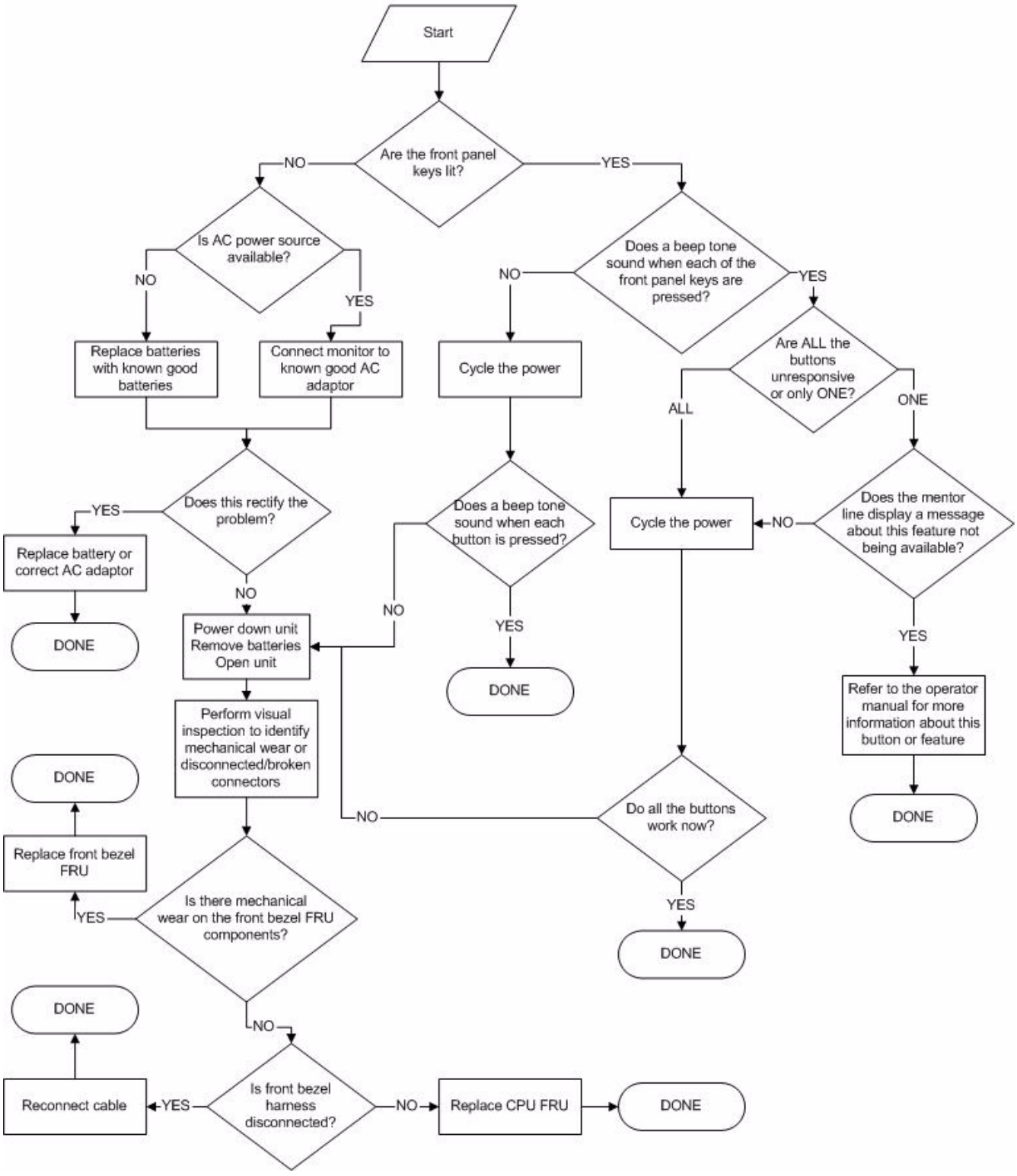


849A

Symptom: Speaker Buzz

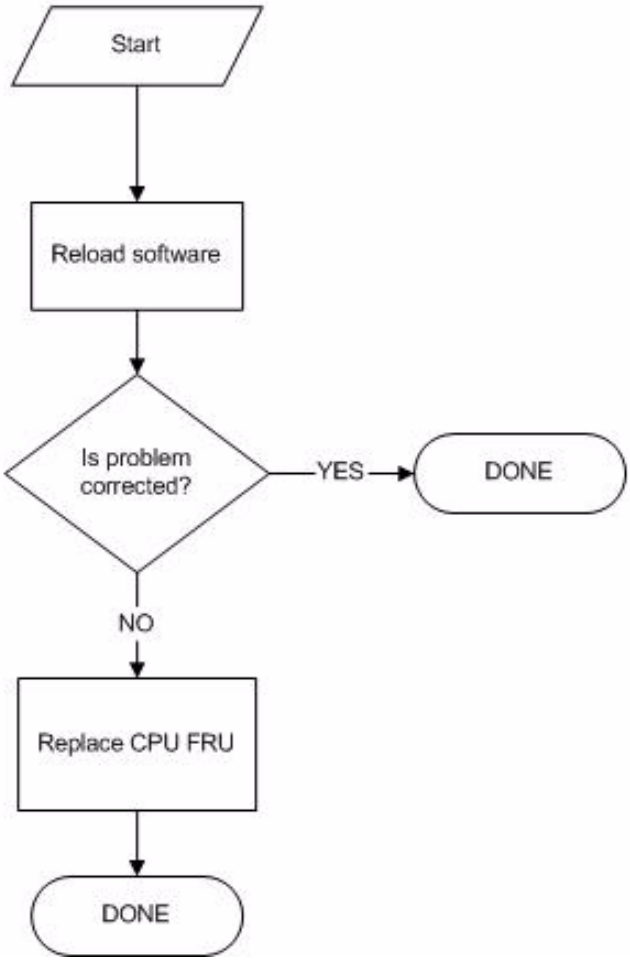


Symptom: Unresponsive Buttons



851A

Symptom: Monitor Resets



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Service Menus

There are two different service menus for the monitor.

- Boot Loader service menu (Boot Code).
- Service Mode menu (Main Code).

Both service menus are generally used by qualified field engineers and factory service personnel to troubleshoot, repair, or download new software to the patient monitor.

WARNING
The Boot Loader Service Menu and the Service Mode menu is intended for qualified personnel only. It is possible to lose patient data and damage the operating software for this monitor. Do not 'experiment' with any commands found in the service menus.

Boot Loader Service Menu

Use the Boot Loader service menu when downloading new Boot Code or Main Code software to the patient monitor or when the patient monitor exhibits a serious failure.

Activate the Boot Loader Program

1. Hold down **NBP GO/STOP** and **ZERO ALL** on the front panel.
2. Press and release the **Trim Knob** control.
3. Keep holding **NBP GO/STOP** and **ZERO ALL** until the Boot Loader information and Service Menu appears on the display.

Following is a list of options in the Boot Loader service menu.

Boot Loader Service Menu Options	
Menu Option	**Description**
CHANGE INTERNET ADDRESS	This option is used when changing the internet protocol (IP) address. Reboot the monitor to implement this change.
SET CONFIGURATION	This menu contains options for country selection (not for text translation) and setting the language for displayed text. See "Set Country Selection" on page 3-12 and "Set Language" on page 3-13.
VIDEO TEST SCREENS	This menu contains various color screens for testing the display. See "Display Tests" on page 4-28.
BATTERY SIMULATION	This option is for engineering use only.

Boot Loader Service Menu Options (Continued)	
Menu Option	**Description**
WAKE UP BATTERY	This option is used when the battery is dead. See "Battery Error Message" on page 5-23 and "How to Wake Up the Battery" on page 4-14.
OPTIONS MENU	This menu contains the option to clear the configuration memory.

To Exit the Boot Loader program

The only way to exit the Boot Loader program is to manually reboot the monitor.

1. Hold down **NBP GO/STOP** and **ZERO ALL**.
2. Press and release the **Trim Knob** control.
3. Release **NBP GO/STOP** and **ZERO ALL**. The monitor will boot up into normal mode.

Service Mode Menu

The Service Mode menu provides the user access to several general and technical built-in software functions of the monitor. Only persons responsible for configuring and maintaining the monitor should access the service mode menu option items.

WARNINGS

The Service Mode menu is intended for use only by qualified service technicians. Experimentation with service mode menu option items can be detrimental to the monitor. Lost patient data, damaged operating system software for the monitor, even network related problems are but a few examples of problems that can be induced as the result of tampering with service mode menu option items.

Some of the service mode menu option items are to be used only by qualified service technicians and others are for general use. Because of this, unnecessary tampering with service mode menu option items for experimentation purposes is not recommended by GE and may cause a malfunction of the monitor.

The Service Mode menu is used for initial setup and configuration as well as for troubleshooting. ALWAYS use caution when using any of these password-protected functions.

The service technician can use the Service Mode menu to:

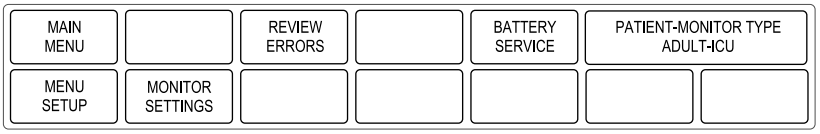
- Relay software information to design engineers.
- Set admit menu options, operating mode of the monitor, and monitor default password.
- Configure the monitor unit name, bed number and Internet address.

Do NOT use ANY of these options unless specifically instructed to do so.

Access the Service Mode Menu

Access the Service Mode menu starting from the Main menu.

1. Select *MORE MENUS* > *MONITOR SETUP* > *SERVICE MODE*.
2. Enter password using the **Trim Knob** control to select the day and month from monitor screen with leading zeros. (e.g. July 4 = 0407).



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Service Mode Menu Options

Following is a list of options in the main code service menu.

Service Mode Menu Options	
Menu Option	**Description**
Review Errors	This menu selection is for advanced troubleshooting by GE engineers. See "Review Errors" on page 5-18.
Battery Service	This is a complete collection of battery data for troubleshooting the batteries.
Patient-Monitor Type	Select the type of monitor desired, i.e adult, neonatal or operating room. See "Set Patient-Monitor Type" on page 3-10.

WARNING
Changing the patient-monitor type will default the admit function to Standard configuration. Different alarms and parameters are activated for each selection.

Service Mode Menu Options (Continued)	
Menu Option	**Description**
MENU SETUP	This menu selection provides the following sub-menu: ■ *MONITOR DEFAULTS PASSWD* This menu selection allows you to set the monitor so that a password is Required or Not Required for entry into the Monitor Defaults menu section. If selected, the password will be the same as the Service Mode Menu password.
MONITOR SETTINGS	This menu selection provides the following sub-menus: (See "Set Unit Name" on page 3-11 and "Set Bed Number" on page 3-12.) ■ *SET UNIT NAME* This menu selection allows changes to the care unit name. After initial setup, this name should not be changed or communication to the central station will be corrupted. Note that the care unit name must be registered exactly the same in the central station and the patient monitor. ■ *SET BED NUMBER* This menu selection allows changes to the bed number. After initial setup, this number should not be changed or communication to the central station will be corrupted. Note that the bed number must be registered exactly the same in the central station and the patient monitor.

Review Errors

The Review Errors menu is an advanced troubleshooting tool used by GE engineering personnel. Some of the information recorded in the monitor error log can be useful for field service troubleshooting.

About the Monitor Error Log

This section provides an introduction to error log usage and meaning. Because the information contained in the error log is engineering-oriented, the intent of the manual is to simply provide a general understanding of this monitor function.

Accessing the Review Errors Menu Option Item

To access the error log and learn more about the Review Errors menu option item, follow these steps:

1. Rotate and press the **Trim Knob** control to select *REVIEW ERRORS* from the Service Mode Menu.
2. The review errors menu option items include four possible selections; one each for viewing output or input errors along with one each for clearing output or input errors. Rotate and press the **Trim Knob** control to scroll to and select *VIEW OUTPUT ERRORS* from the Review Errors Menu.
3. The Run Time Error Log pop-up window appears on the left side of the monitor display. One time-dated output software error appears in the pop-up window at a time.
4. Use the **Trim Knob** control to scroll through each logged error and peruse all of the parameters associated with each output software error. Rotate the **Trim Knob** control to move the cursor (>) to a position for viewing the Next or Previous error as well as the position that allows the user to Quit viewing output errors.
5. Selecting Quit closes the Run Time Error Log pop-up window and returns to the Review Errors Menu.
6. The View Input Errors menu causes a Run Time Error Log pop-up window to appear on the monitor display. The pop-up window now displays input software errors and provides basically the same information as the View Output Errors pop-up window provided. The appearance of both pop-up windows are similar, the difference being errors that are logged as input versus output to/from the monitor.
7. To clear out the stored run time error logs, use the **Trim Knob** control to select the *CLEAR OUTPUT ERRORS* or *CLEAR INPUT ERRORS* menu, respectively.

   Immediately after you clear one of the error logs, a message appears on the upper right side of the display. The message verifies the actuation of the **Trim Knob** control for this function.

Error Log Information

This part of the section describes in greater detail what information the error log contains and what can be learned from error logs.

An error log in the monitor can hold up to 50 events. As an event occurs, error information is stored in the log. Subsequent events are stored sequentially as they occur. When the 50-event limit is reached, subsequent errors replace the oldest error(s) in the log.

A sample of the monitor error log pop-up window appears as follows:

When using the error log to troubleshoot a problem with the monitor, the following parameters from the pop-up window that are of greatest interest are as follows.

Error Log Parameters	
Parameter	**Description**
PROCESS NAME	The task that was operating when the event or problem occurred.
ERROR CODE	A software code for the type of event or problem that occurred.
SEVERITY	Indicates the level of impact of the event or problem on the system.
DATE	The date the event or problem occurred.
TIME	The time the event or problem occurred.
ERROR NUMBER	A sequential number used to identify each event or problem.
INPUT ERROR	Additional information used to determine the cause of the error.

Error Logs

Error logs contain more than just operating system errors. Many events that occur that might have an impact upon the system are entered into the log. These logs may be requested by Tech Support on occasion to aid in troubleshooting the monitor. The logs are developed to aid engineering for internal diagnostics of the monitor. Contact Tech Support if you need clarification of any of the error logs.

Severity of the Error

Severity is a measure of how the event/error affected the system. There are three levels of severity. The following is a list of these levels accompanied by a brief description of each.

Severity of the Error	
Error	**Description**
CONTINUE	The event or error was logged, the task may or may not have completed, but the system was able to continue operating. Most error log entries have this severity level.
FATAL	The event or error was logged, the task did not complete, and the system was unable to continue operating as recovery was not possible. This level of severity in an event or error is always followed by an automatic warm start.
FORCED RESET	The operating system restarted normally after a known condition, such as an Internet address change, patient discharge, etc.

Battery Alarms and Messages

Alarm Conditions

Battery alarms occur when one of the following conditions occur:

- Low Battery.
- Empty Battery.
- Battery Failures.
- Charger Failures.

Battery Messages

The following battery messages are displayed in the ECG Waveform Area.

Message	Battery Alarm	Cause
BATTERY LOW	System *WARNING*	Critical Low Battery—Only 10 minutes per battery of run time remaining (10 minutes if one battery, 20 minutes if two batteries).
POWERING DOWN	System *WARNING*	Empty Battery—There is no battery run time remaining.
CHECK BATT STATUS	System *MESSAGE*	Battery Failure—A minor failure has occurred while using or charging the battery.
BATTERY ERROR	System *WARNING*	Battery Failure—A serious failure has occurred while using or charging the battery.
CHECK BATT STATUS **NOTE** *INTERNAL CHARGER FAILED, CALL SERVICE* also appears in the Battery Status information window.	System *MESSAGE*	Charger Failure—Charger communications have failed.

Battery Messages

The following battery messages are displayed in the Battery Status information window.

Message	Battery Alarm	Cause
INTERNAL CHARGER FAILED, CALL SERVICE **NOTE** *CHECK BATT STATUS* also appears in the ECG waveform area.	System *MESSAGE*	Charger Failure—Charger communications have failed.
CONDITION	None	Condition —The battery is requesting a conditioning cycle.

Battery Error Message

The following battery message is displayed in the Battery Fuel Gauge icon.

Message	Reason	Solution
ERROR	The battery is either asleep or faulty.	1. See “How to Wake Up the Battery” on page 4-14. 2. If the battery does not “wake up” it is faulty and should be replaced.

Power Source Tests

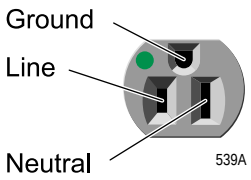
Wall Receptacle

Use this procedure to confirm AC power from the wall receptacle which the monitor is plugged into.

Use a digital multimeter (DMM) to verify the wall receptacle is wired correctly. This is accomplished by performing a:

- voltage measurement between all three connections of the wall receptacle;
- ground-to-neutral loop resistance measurement.

A standard wall receptacle consists of three connections: line, neutral and ground. The figure below indicates the location of each on a 120 VAC wall receptacle commonly used in the United States. The location and shape of pins may be different on wall receptacles used in countries other than the United States.



Perform the following tests:

1. Use a DMM to measure the voltage between the three connections.
   a. Select the AC voltage scale on the DMM.
   b. Measure the voltage from line to neutral, line to ground, and neutral to ground and make sure these are correct. With a correctly wired wall receptacle used in the United States, the following readings should be obtained:

      Line to neutral: 120 VAC
      Line to ground: 120 VAC
      Neutral to ground: < 3 VAC

      Readings other than these indicate improper wiring. Have the wall receptacle checked by an electrician.

2. Use a DMM to measure the ground-to-neutral loop resistance.

CAUTION
DO NOT check the ground-neutral loop resistance unless the wall receptacle is correctly wired.

   a. Select the milliohms (mΩ) scale on the DMM.

   b. Measure resistance across the power cord ground and neutral.

   c. Measure from the ground lug on the rear power connector to any exposed metal of the monitor. The resistance between the ground and neutral connections, after the ohmmeter is nulled, must be less than 100 mΩ. If not, have the wall receptacle checked by an electrician.

Power Cord and Plug

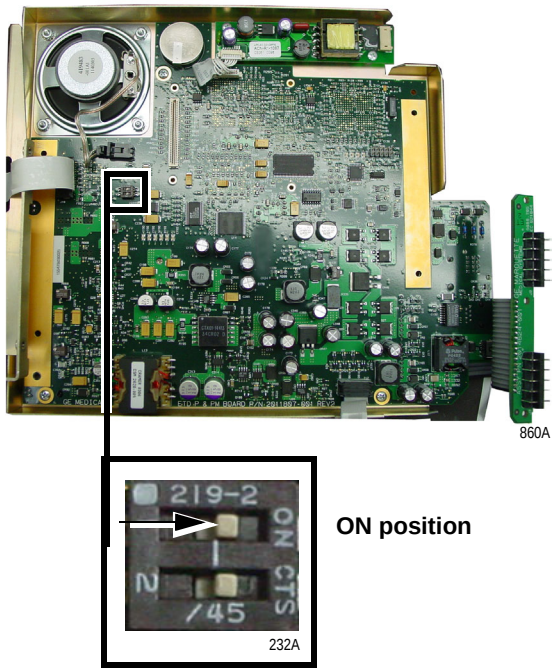
Verify the power cord being used with the monitor is good. The following are a couple of things to check for in this regard:

- Failure of the power cord strain relief is very common. Often times users of the equipment pull on the power cord itself, rather than the power cord plug, to unplug the monitor from a wall receptacle. If in doubt, test for continuity through each conductor of the power cord connector and plug.
- Verify line, neutral, and ground conductors are properly connected to the power cord plug and are not short-circuited. Rewire and tighten these, or replace the power cord, as necessary.

Error Messages

The following table describes error messages that may appear on the display and how to resolve the problem.

Message	Possible Reason/Solution
"WARNING: The EEPROM data was found to be either INVALID or uninitialized. GE factory defaults will be stored in both the EEPROM and the monitor's configuration memory. You will be required to re-enter the network configuration, re-enable any password protected features and restore all monitor settings and site-specific defaults."	Following the EEPROM dump, restore data: 1. Restore Ethernet address and IP address as requested by the Boot Code. 2. Power cycle. 3. If error message persists, replace processor pcb. If error message no longer occurs, re-enable any password protected features and restore all monitor settings and site-specific defaults via *SERVICE MENU* > *Set Configuration*, and *Options Menu*.
"WARNING: THIS VERSION OF BOOT CODE IS NOT COMPATIBLE WITH THE VERSION OF MAIN CODE CURRENTLY STORED IN FLASH. PLEASE UPDATE THE BOOT CODE."	1. Power cycle. 2. Reload Boot Code. 3. If problems persists, replace the main PCB assembly FRU. See Chapter 6, "Parts List, Drawings, and Replacement." for instructions.
"Boot Flash test FAILED." *"ERROR: The Boot Code stored in Flash is not valid. Main Code cannot be loaded until valid Boot Code exists."*	1. Power cycle. 2. Reload Boot Code. 3. If problems persists, replace the main PCB assembly FRU. See Chapter 6, "Parts List, Drawings, and Replacement." for instructions.
"Main Flash test FAILED." *"ERROR: The Main Code stored in flash is not valid."*	1. Power cycle. 2. Reload Boot Code. 3. If problems persists, replace the main PCB assembly FRU. See Chapter 6, "Parts List, Drawings, and Replacement." for instructions.
"Static RAM test FAILED." *"ERROR: The SRAM memory test failed. Main Code will not be loaded unless this test passes. Reboot the monitor to repeat testing."*	Replace the main PCB assembly FRU. See Chapter 6, "Parts List, Drawings, and Replacement." for instructions.
"Real Time Clock FAILED - will not start." *"WARNING: The real time clock chip is not running. Main Code cannot be loaded until this chip is started. Attempting to start real time clock..."* Followed by either: *"The real time clock was started. Select Start Patient Monitoring to load and execute Main Code."* Or *"ERROR: Unable to start the real time clock."*	If problem persists and error message displays, replace the main PCB assembly FRU. See Chapter 6, "Parts List, Drawings, and Replacement." for instructions.
PREVENTIVE MAINTENANCE REQUIRED	Perform all of the maintenance procedures listed under, "Manufacturer Recommendations" on page 4-3.

Message	Possible Reason/Solution
Internal lithium battery is LOW. **NOTE** These messages are displayed while the monitor powers up. Once the "Internal lithium battery is LOW" message appears, the monitor will complete all the power-up tests. Then, after the last test is completed, the following message will be displayed on the boot loader screen. *ONE OR MORE POWER-UP TESTS HAVE FAILED ** SERVICE MAY BE REQUIRED ** DO YOU WISH TO CONTINUE MONITORING ANYWAY?* *1 = no, 2 = yes*	The main PCB battery may be depleted. 1. Select *NO* when the message, *"DO YOU WISH TO CONTINUE MONITORING ANYWAY?"* appears. 2. Remove this monitor from service and use a different monitor to monitor the patient. 3. Contact GE Service for lithium battery replacement instructions.
	The battery switch on main pcb may be in the off position. See "Replacing the Main PCB Assembly" on page 6-44 for information about accessing the main PCB. 1. Verify that switch **1** on the mini-dip switch (labeled **S1**) is in the **ON** position.  **ON position** 2. To move the battery switch to the **ON** position, complete the following steps. a. If a plastic film is over the switch, remove and discard the plastic film. b. Use a small, flat-head screw driver to move the switch to the **ON** position. c. Complete all of the "Recommended Electrical Safety Tests and Checkout Procedures" on page 6-52.
	The processor pcb may be defective. See "Replacing the Main PCB Assembly" on page 6-44.

For your notes

6 Parts List, Drawings, and Replacement

For your notes

Ordering Parts

The parts lists and assembly drawings in this chapter supply enough detail for you to order parts for the assemblies considered field serviceable. If you require additional information or troubleshooting assistance, contact Technical Support.

To order parts, contact Service Parts at the address or telephone number listed on the “How to Reach Us...” page found in the front of this manual.

Service Parts

Field Replaceable Units (FRUs)

The following Field Replaceable Units are available for this product:

862A

2014437-002 — display sub-assembly
(includes front plastic, LCD, keypad, and **Trim Knob** control)

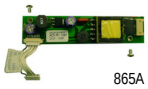
863A

2014437-003 — front plastic with switch assemblies (includes keypad and **Trim Knob** control)

2014437-005 — software

864A

2014437-006 — speaker assembly


865A

2014437-007 — inverter PCB and harness

866A

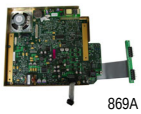
2014437-008 — foot

867A

2014437-009 — battery doors

868A

2014437-010 — collar


869A

2014437-011 — main PCB assembly

FRU Parts Lists

Display Sub-assembly — PN 2014437-002, Rev. A

Find Number	Item Number	Item Description	Reference Designator	Qty
1	2012147-001	ASSY EMERALD TRANSPORT DISPLAY		1
2	2005565-005	PKG BAG CUSHION ZIP 15 X 15 STATIC SHLD		1
3	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
4	407132-008	LBL BARCODE CMPNT PA 1.6 X		1
5	404525-001	LABEL BLANK 2 X 3/4		1
6	406128-001	CARTON MAILER W/FOAM 14.5 X 14.5 X 4.5		1
7	402440-001	SCREW PH PLASFORM #6-10 X .		6
8	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		1
9	2011633-001	LABEL KIT - TRANSPORT PRO FRONT ENG		1
10	2011633-002	LABEL KIT - TRANSPORT PRO FRONT GER		1
11	2011633-003	LABEL KIT - TRANSPORT PRO FRONT FRE		1
12	2011633-004	LABEL KIT - TRANSPORT PRO FRONT SWE		1
13	2011633-005	LABEL KIT - TRANSPORT PRO FRONT SPA		1
14	2011633-006	LABEL KIT - TRANSPORT PRO FRONT ITA		1
15	2011633-007	LABEL KIT - TRANSPORT PRO FRONT DUT		1
16	2011633-008	LABEL KIT - TRANSPORT PRO FRONT DAN		1
17	2011633-009	LABEL KIT - TRANSPORT PRO FRONT NOR		1

Find Number	Item Number	Item Description	Reference Designator	Qty
18	2011633-010	LABEL KIT - TRANSPORT PRO FRONT JPN		1
19	2011633-011	LABEL KIT - TRANSPORT PRO FRONT POR		1
20	2011633-012	LABEL KIT - TRANSPORT PRO FRONT RUS		1
21	2011633-013	LABEL KIT - TRANSPORT PRO FRONT CHI		1
22	2011633-014	LABEL KIT - TRANSPORT PRO FRONT HUN		1
23	2011633-015	LABEL KIT - TRANSPORT PRO FRONT POL		1

Front Plastic with Switch Assemblies — PN 2014437-003, Rev. A

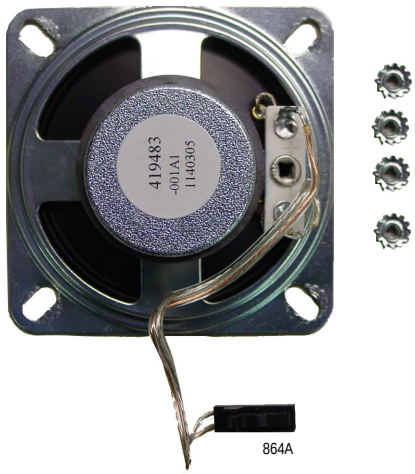
Find Number	Item Number	Item Description	Reference Designator	Qty
1	402440-001	SCREW PH PLASFORM #6-10 X .		6
2	2002161-001	BEZEL DASH 4000 FRONT		1
3	2015204-001	PCB TRANSPORT PRO KEYPAD ENCODER		1
4	2003610-001	CLIP DASH 4000 TK GND		1
5	406080-001	TRIM KNOB EAGLE		1
6	4556-001	SPRING CLIP D TYPE .250 DIA		1
7	2005565-005	PKG BAG CUSHION ZIP 15 X 15 STATIC SHLD		1
8	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
9	407132-008	LBL BARCODE CMPNT PA 1.6 X		1
10	404525-001	LABEL BLANK 2 X 3/4		1
11	406128-001	CARTON MAILER W/FOAM 14.5 X 14.5 X 4.5		1
12	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		1
13	2000905-001	SCR TAPPING TC SST #4X.31 HI-LO		5
14	2011633-001	LABEL KIT - TRANSPORT PRO FRONT ENG		1
15	2011633-002	LABEL KIT - TRANSPORT PRO FRONT GER		1
16	2011633-003	LABEL KIT - TRANSPORT PRO FRONT FRE		1
17	2011633-004	LABEL KIT - TRANSPORT PRO FRONT SWE		1
18	2011633-005	LABEL KIT - TRANSPORT PRO FRONT SPA		1
19	2011633-006	LABEL KIT - TRANSPORT PRO FRONT ITA		1

Find Number	Item Number	Item Description	Reference Designator	Qty
20	2011633-007	LABEL KIT - TRANSPORT PRO FRONT DUT		1
21	2011633-008	LABEL KIT - TRANSPORT PRO FRONT DAN		1
22	2011633-009	LABEL KIT - TRANSPORT PRO FRONT NOR		1
23	2011633-010	LABEL KIT - TRANSPORT PRO FRONT JPN		1
24	2011633-011	LABEL KIT - TRANSPORT PRO FRONT POR		1
25	2011633-012	LABEL KIT - TRANSPORT PRO FRONT RUS		1
26	2011633-013	LABEL KIT - TRANSPORT PRO FRONT CHI		1
27	2011633-014	LABEL KIT - TRANSPORT PRO FRONT HUN		1
28	2011633-015	LABEL KIT - TRANSPORT PRO FRONT POL		1

Software — PN 2014437-005, Rev. A

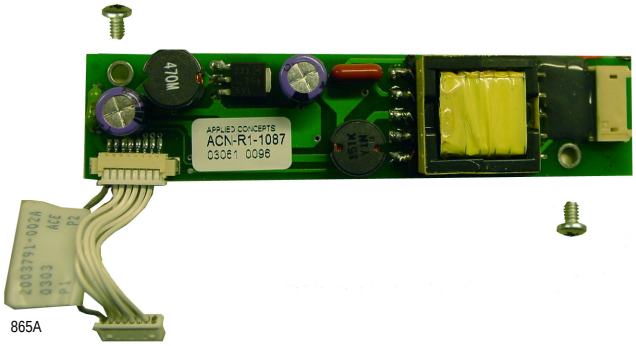
Find Number	Item Number	Item Description	Reference Designator	Qty
2	418208-001	BAG ANTI-STATIC 6 X 8 ZIPLOCK		1
3	9924-102	BOX MAILER 7.00L 6.00W 2.50H		1
4	404525-001	LABEL BLANK 2 X 3/4		1
5	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
6	2017716-001	UPGRADE KIT TRANSPORT PRO V1A ENG		

Speaker Assembly — PN 2014437-006, Rev. A



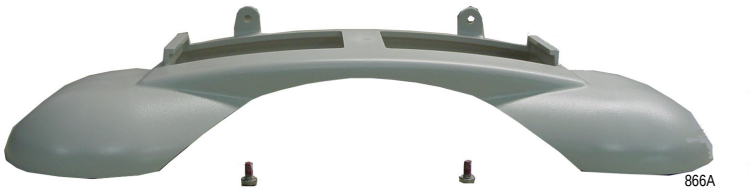
Find Number	Item Number	Item Description	Reference Designator	Qty
1	419483-001	SPEAKER ASSEMBLY DASH	SP1	1
2	4521-704	NUT,HEX,KEPS,4-40,		4
3	404525-001	LABEL BLANK 2 X 3/4		1
4	9956-002	4X6IN ANTI-STATIC ZIPLOCK BAG		1
5	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		1
6	9924-002	BOX CARDBOARD 4 X 4 X 3		1
7	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
8	407132-008	LBL BARCODE CMPNT PA 1.6 X		1

Inverter PCB and Harness — PN 2014437-007, Rev. A



Find Number	Item Number	Item Description	Reference Designator	Qty
1	2004019-001	PWR SPLY CCFL INVERTER VIN8-18V	A2	1
2	2003791-002	CABLE ASSY DASH 4000 INVERTER	W1	1
3	45074-408	SCREW BDGH 4-40 X 1/4		2
4	2005565-003	PKG BAG CUSHION ZIP 4 X 6 STATIC SHIELD		1
5	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
6	407132-008	LBL BARCODE CMPNT PA 1.6 X		1
7	404525-001	LABEL BLANK 2 X 3/4		1
8	9924-002	BOX CARDBOARD 4 X 4 X 3		1
9	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		

Foot — PN 2014437-008, Rev. A



Find Number	Item Number	Item Description	Reference Designator	Qty
1	2012182-001	FOOT TRANSPORT DISPLAY		1
2	2000540-001	SCR MACH PNHD M3X6LG SST W/THD LOCK		2
3	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		1
4	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
5	404525-001	LABEL BLANK 2 X 3/4		1
6	9924-101	BOX MAILER 11.75L 11.00W 2.88H		1
7	9956-001	BAG ANTI-STATIC 12SQ 4MIL		1

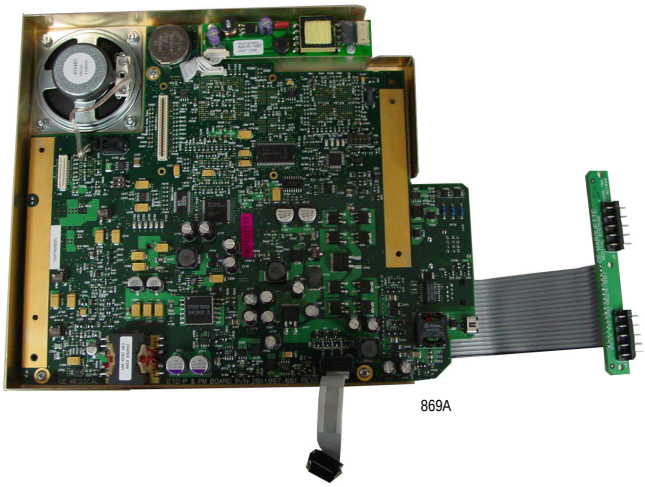
Battery Doors — PN 2014437-009, Rev. A

Find Number	Item Number	Item Description	Reference Designator	Qty
1	2013017-001	PLUG EMERALD DISPLAY BATTERY		1
2	2000905-001	SCR TAPPING TC SST #4X.31 HI-LO		2
3	404525-001	LABEL BLANK 2 X 3/4		1
4	9956-002	4X6IN ANTI-STATIC ZIPLOCK BAG		1
5	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		1
6	9924-002	BOX CARDBOARD 4 X 4 X 3		1
7	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1

Collar — PN 2014437-010, Rev. A

Find Number	Item Number	Item Description	Reference Designator	Qty
1	2012181-001	COLLAR CABLE TRANSPORT DISPLAY		1
2	2013297-001	ADH VHB ETD		2
3	9956-001	BAG ANTI-STATIC 12SQ 4MIL		1
4	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
5	404525-001	LABEL BLANK 2 X 3/4		1
6	9924-101	BOX MAILER 11.75L 11.00W 2.88H		1

Main PCB Assembly — PN 2014437-011, Rev. A

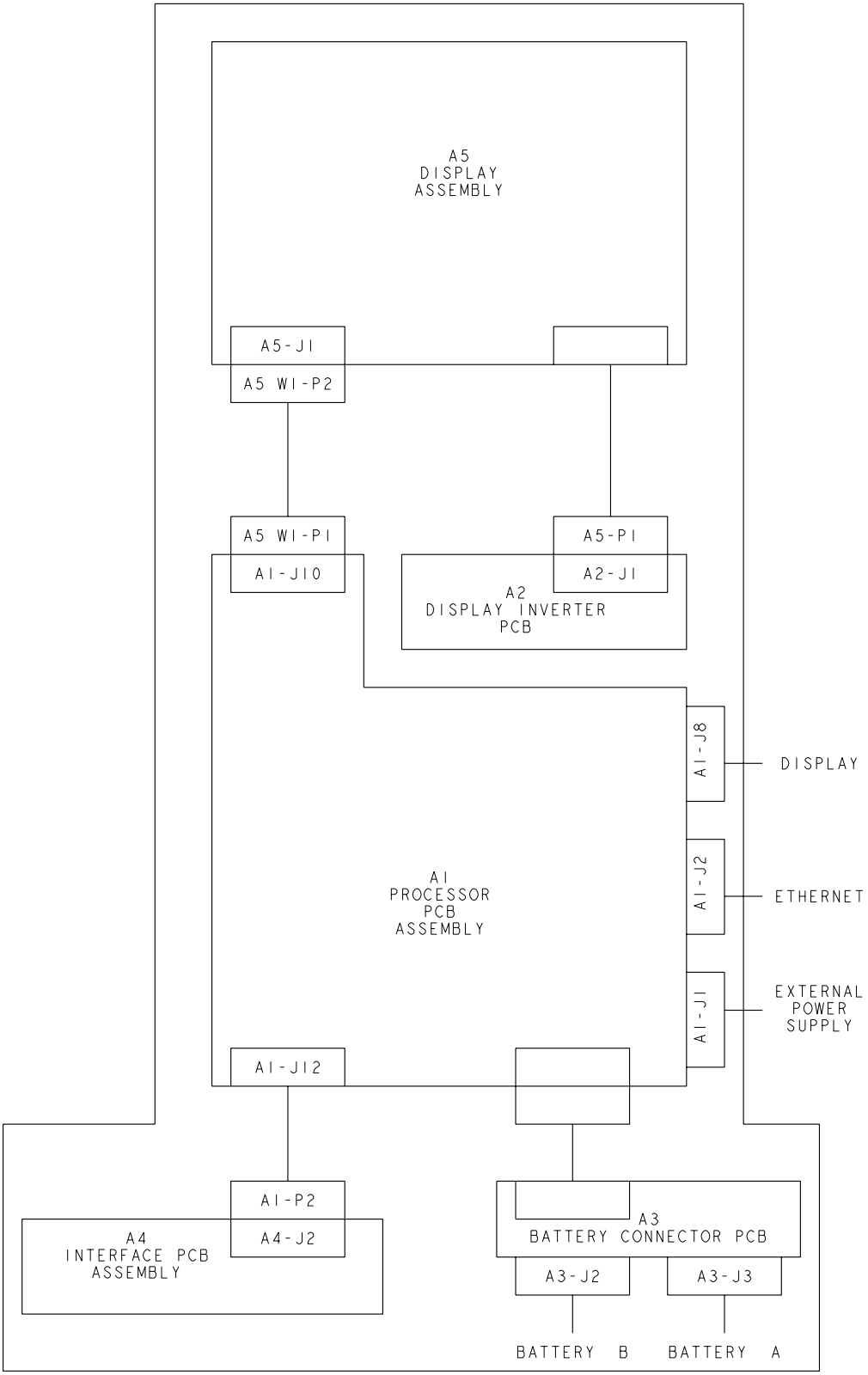


Find Number	Item Number	Item Description	Reference Designator	Qty
1	2013150-001	ASSY PROCESSOR PCB TRANSPORT DISPLAY		1
2	2005565-005	PKG BAG CUSHION ZIP 15 X 15 STATIC SHLD		1
3	2001005-061	INSTR FIELD REPLACEMENT UNIT ENG		1
4	407132-008	LBL BARCODE CMPNT PA 1.6 X		1
5	404525-001	LABEL BLANK 2 X 3/4		1
6	406128-001	CARTON MAILER W/FOAM 14.5 X 14.5 X 4.5		1
7	409914-001	SCREW M3 X 14 P/H POSI S/S		4
8	402440-001	SCREW PH PLASFORM #6-10 X .		6
9	9956-101	BAG ZIPLOCK CLR 2MIL POLY 3		1

Other Components

Item Number	Item Description	Qty
2011432-001	Tram Chute	1
2012183-001	Optional External Power Supply	1
419068-004	Rechargeable Lithium Ion Battery 11.1V	1
2001845-001	Cadex SMart Two+ Battery Charger V1.11	1
421071-001	Lithium Ion Battery PC Mount 3V	1

Interconnection Diagram

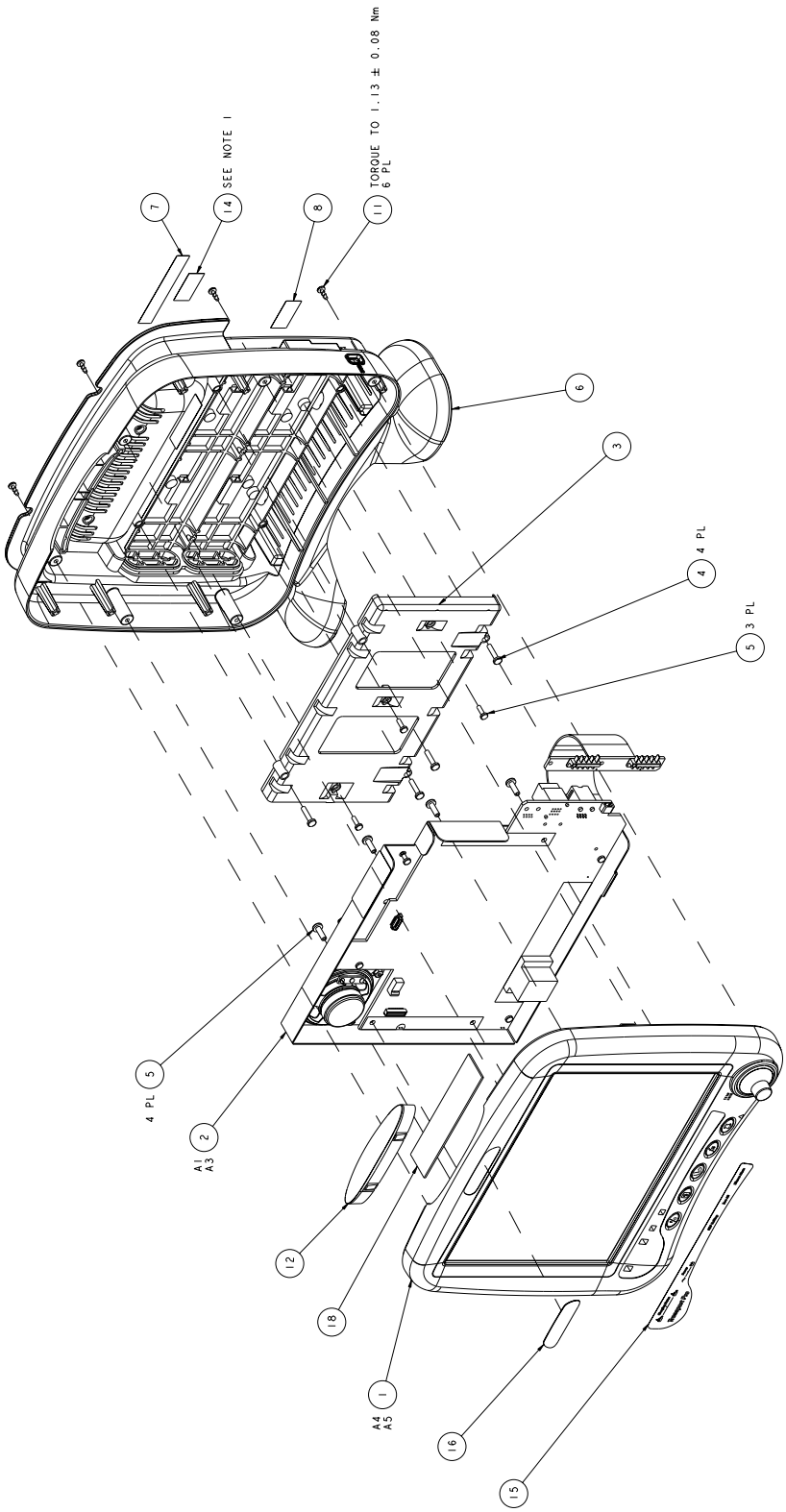


INTERCONNECT SCHEMATIC

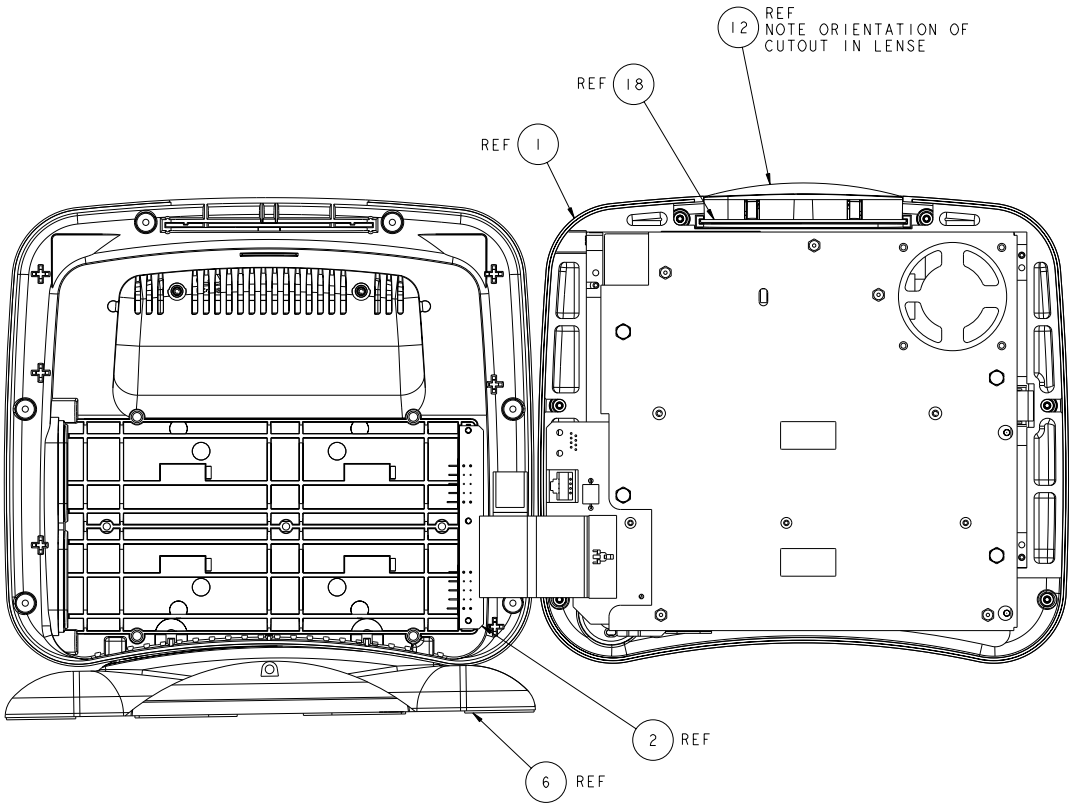
Exploded Views

Transport Pro Display Assembly — PN 2012150-001, Rev. A

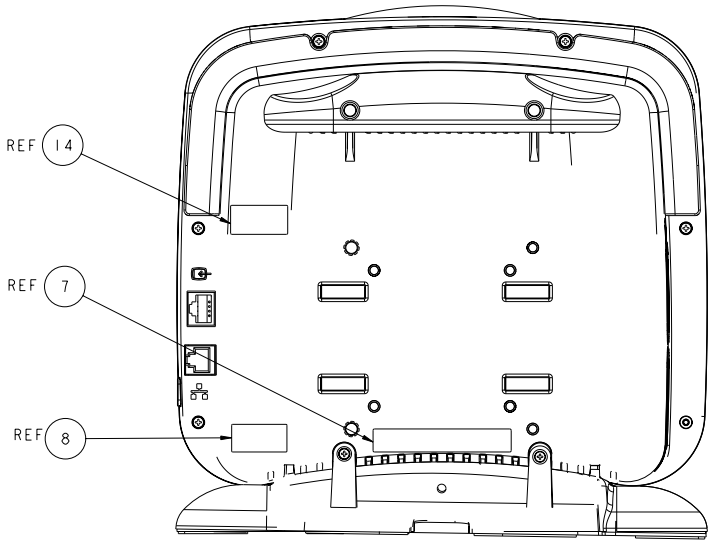
Sheet 1 of 2



Sheet 2 of 2



UNIT OPEN

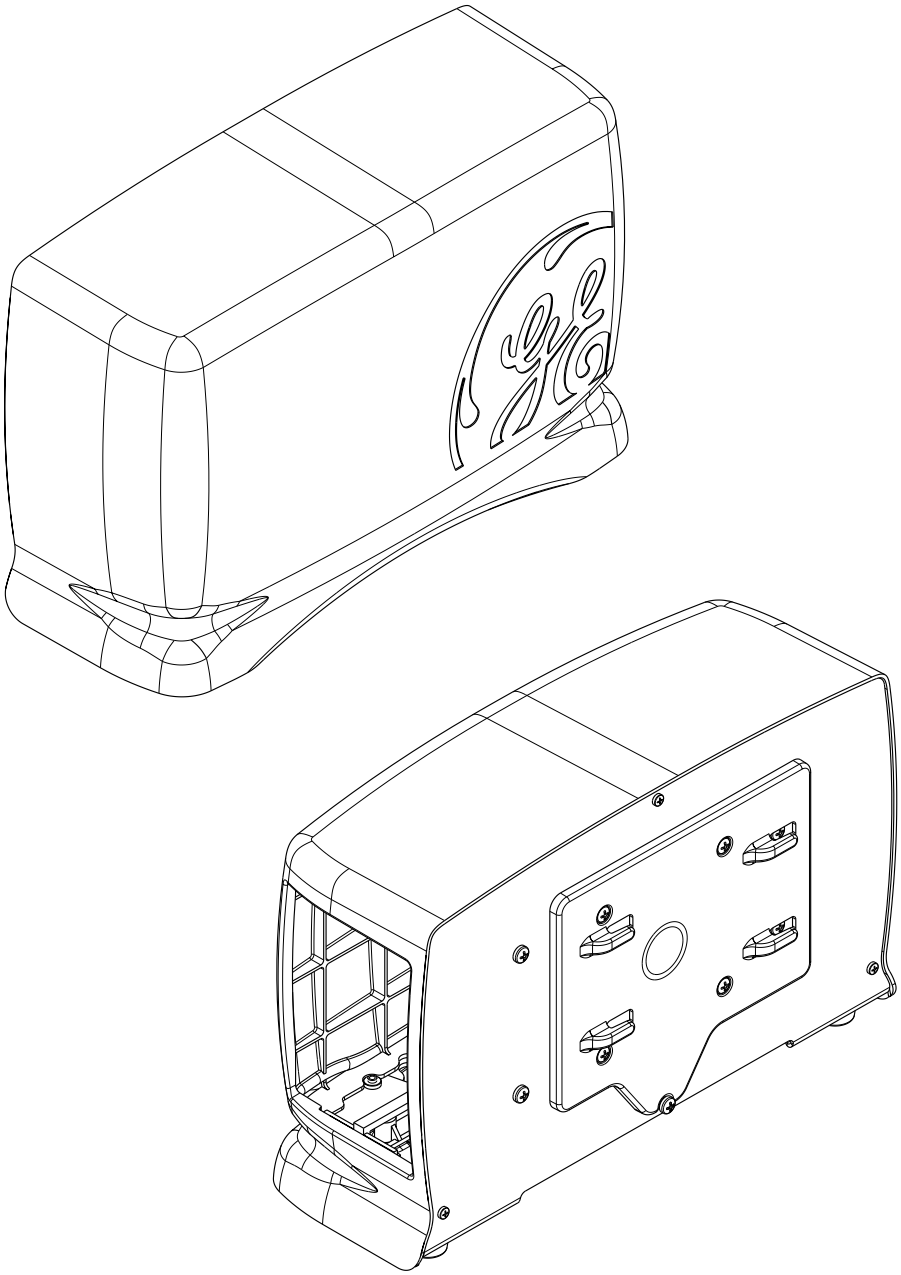


BACK VIEW

Parts List for Transport Pro Display Assembly — PN 2012150-001, Rev. A

Find Number	Item Number	Item Description	Reference Designator	Qty
1	2012147-001	ASSY EMERALD TRANSPORT DISPLAY	A4,A5	1
2	2013150-001	ASSY PROCESSOR PCB TRANSPORT DISPLAY	A1,A3	1
3	417436-002	BATTERY HOUSING BOTTOM		1
4	2000546-006	SCR MACH PNHD M4 X 20LG SST W/THD LOCK		4
5	409914-002	SCR M3 X 14 P/H POSI S/S W/VIB TITE		7
6	2016494-001	ASSY COVER PLASTIC TRANSPORT PRO		1
11	402440-001	SCREW PH PLASFORM #6-10 X .		6
12	2002218-002	LENSE DASH 4000 OPAQUE		1
14	404525-008	LABEL BLANK 1.2IN X .6IN		2
18	2004228-001	CKT BD DASH 4000 ALARM LIGHT		1
23	2014287-001	CODE TRANSPRO BOOT V1A		1
24	2014286-001	CODE TRANSPRO MAIN V1A - MULTI		1

Transport Pro Display Tram Chute — PN 2011432-001, Rev. A



Disassembly/Assembly of FRUs

Guidelines for Disassembly

WARNINGS

REPAIR TO THE FRU LEVEL — Field repairs are recommended to the field replaceable unit (FRU) only. Attempting a field repair on a PCB or a factory sealed component or assembly could jeopardize the safe and effective operation of the monitor.

NOTE

GE recommends that you assemble the monitor using the NEW fasteners (screws, washers, etc.) provided in the Field Replaceable Unit kit. Some fasteners, like the screws with a thread locking coating, are NOT intended to be re-used more than three times.

Tools Required

A standard set of hand tools is required for disassembly and assembly.

Before Disassembly

Before you disassemble the monitor, you should ALWAYS do the following tasks.

1. Unplug the monitor from the AC power source.
2. Remove both batteries.
3. Provide appropriate electrostatic discharge protection to prevent damaging the monitor.
4. Be aware that the nonspecific disassembly instructions apply to all monitors supported by this service manual. Disassembly for specific models of the monitor are identified when required.

During Disassembly

When disassembling the monitor, observe the following guidelines:

- Note the positions of wires, cables, and different sized screws; marking them if necessary to ensure they are replaced correctly.

PCB Assemblies

Electrostatic Discharge (ESD) Precautions

All external connector inputs and outputs of the monitor are designed with protection from ESD damage. However, if the monitor requires service, exposed components and assemblies contained within are susceptible to ESD damage. This includes human hands, non-ESD protected work stations and/or improperly grounded test equipment.

The following guidelines help make a service workstation more resistant to the ESD damage:

- Discharge any static charge you may have built up before handling semiconductors or assemblies containing semiconductors.
- A grounded, antistatic wristband (3M part number 2046 or equivalent) or heel strap should be worn *at all times* while handling or repairing assemblies containing semiconductors.
- Use properly grounded soldering and test equipment.
- Use a static-free work surface (3M part number 8210 or equivalent) while handling or working on assemblies containing semiconductors.
- DO NOT remove semiconductors or assemblies containing semiconductors from antistatic containers (Velo-stat bags) until absolutely necessary.
- Make sure power to an assembly is turned off before removing or inserting a semiconductor.
- DO NOT slide semiconductors or electrical/electronic assemblies across any surface.
- DO NOT touch semiconductor leads unless absolutely necessary.
- Semiconductors and electrical/electronic assemblies should be stored only in antistatic bags or boxes.
- Handle all PCB assemblies by their edges.

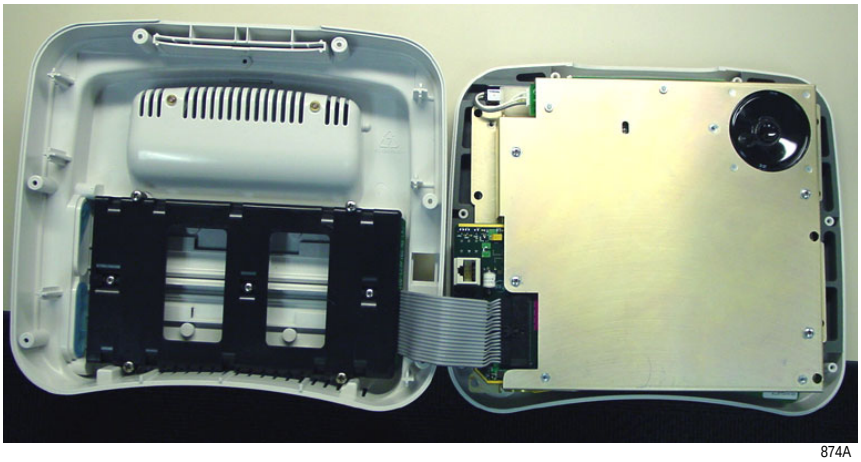
These guidelines may not guaranty a 100% static-free workstation, but can greatly reduce the potential for failure of any electrical/electronic assemblies being serviced.

Disassembly Procedures

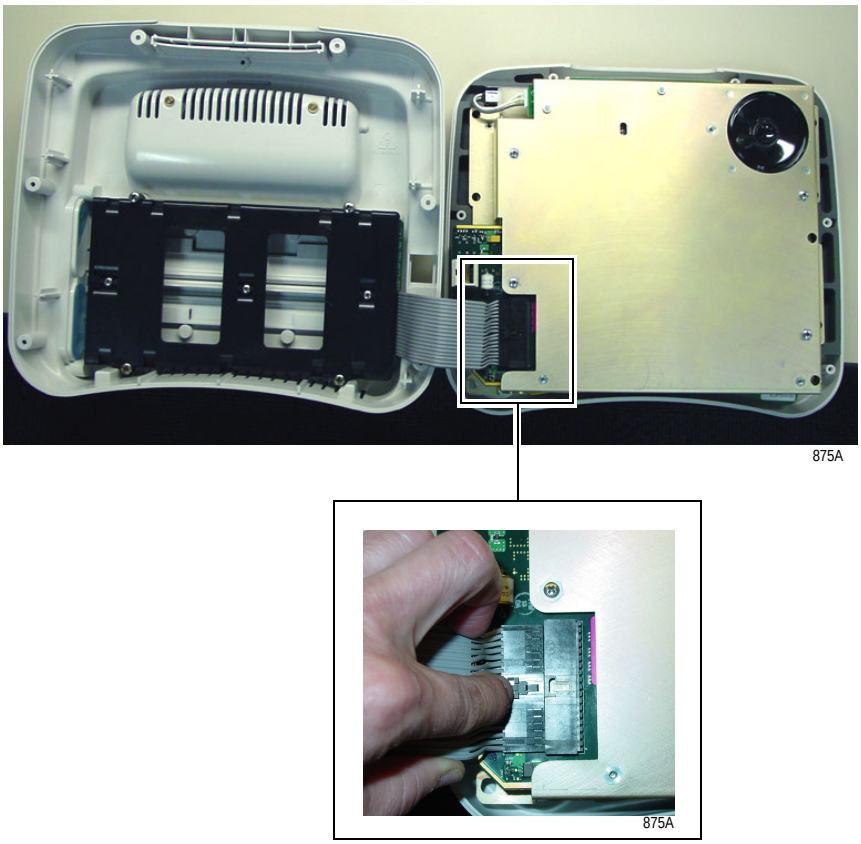
Open the Unit

1. Unplug the monitor from the AC power source.
2. Remove both batteries.
3. Remove the Tram chute mounting screw and remove the Tram chute. See "Removing the Tram Chute" on page 3-6.
4. Provide appropriate electrostatic discharge protection to prevent damaging the monitor.
5. Remove the six screws to separate the display sub-assembly from the back half of the unit.

6. Lay both halves of the unit on a flat surface. To prevent damaging the **Trim Knob** control, ALWAYS hang the **Trim Knob** control over the edge of the work surface.



7. Disconnect the battery harness from the main PCB and set the back half of the unit aside.

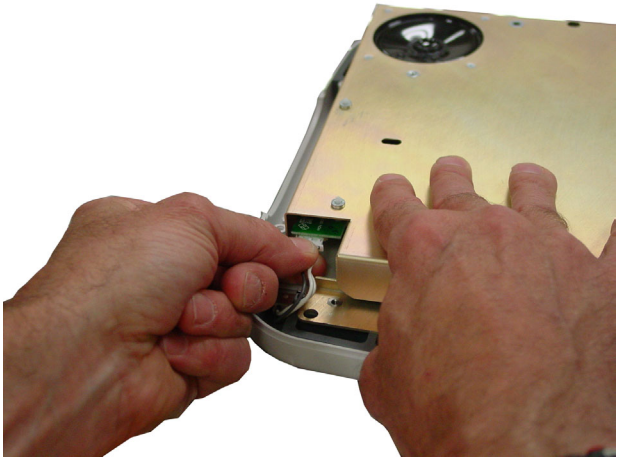


Replacing the Display Sub-assembly

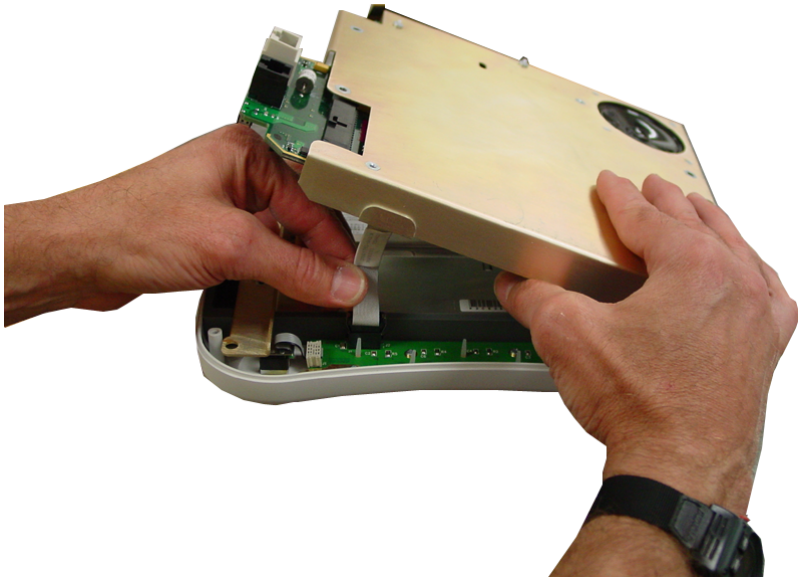
1. Open the Unit. See “Open the Unit” on page 6-22.
2. Remove the four screws holding the main PCB assembly to the display sub-assembly.

879A

3. Pull out friction connector from the inverter PCB. Do not pull on the connector wires.

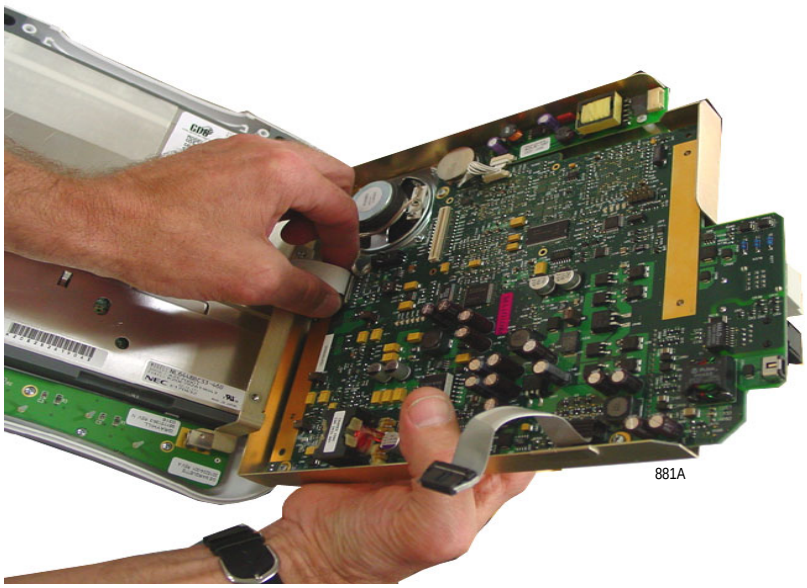

878A

4. Squeeze the connector tabs and pull out the connector from the keypad PCB.



880A

5. Pull out the display friction connector from the main PCB. Do not pull on the ribbon cable.



881A

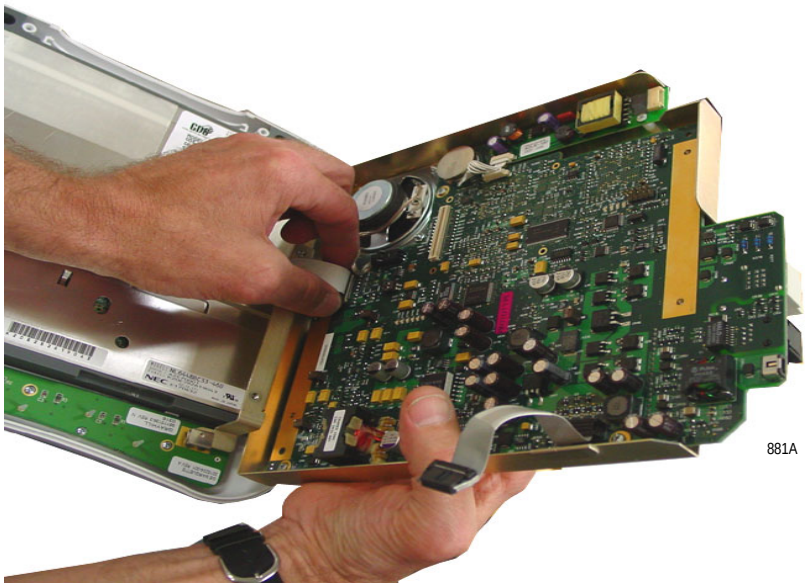
6. Remove the PCB and set it aside.
7. Place the display sub-assembly face-down with the **Trim Knob** control hanging over the edge of the work surface.

8. Remove the two screws from the shipping bracket. Discard the bracket.

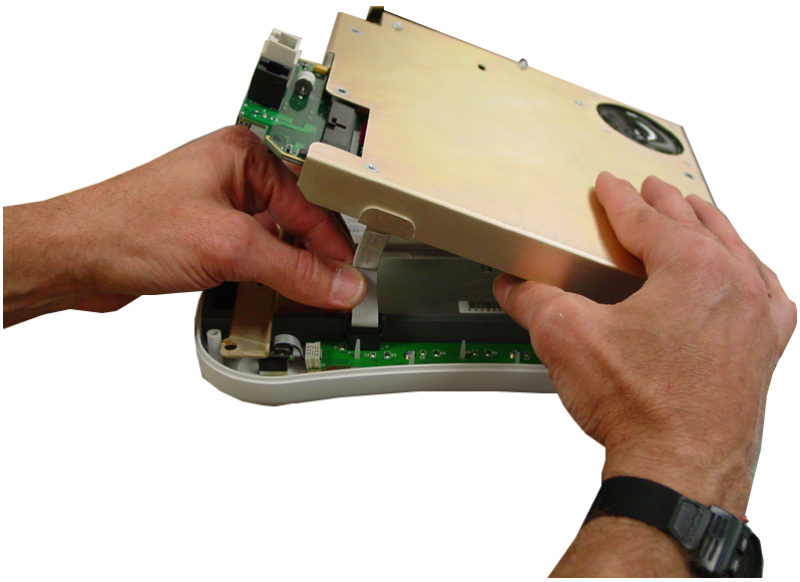
CAUTION
EQUIPMENT DAMAGE — The display sub-assembly components are NOT secured once you remove the shipping bracket. ALWAYS keep the display sub-assembly on a flat surface with the **Trim Knob** control hanging over the edge of the work surface.

862A

9. Insert the display friction connector into the main PCB connector.

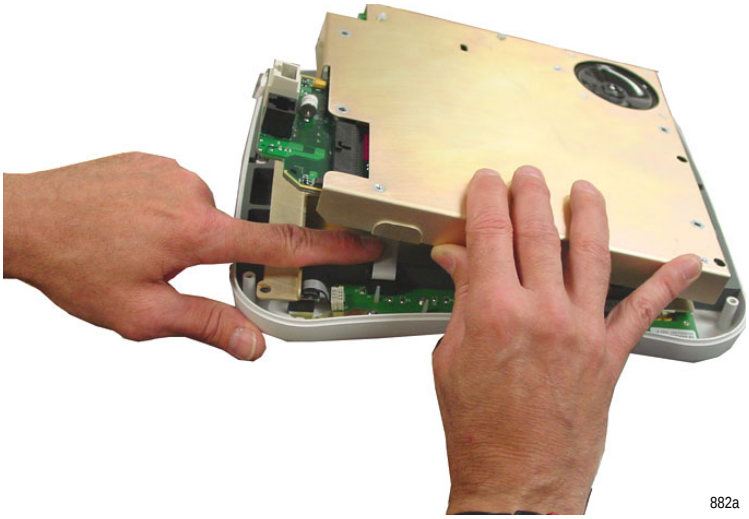

881A

10. Insert the keypad PCB connector into the keypad PCB.



880A

11. Tuck in the keypad PCB ribbon cable to prevent it from being damaged.



882a

12. Insert the display friction connector into the inverter PCB connector.

878A

13. Install four screws to secure the main PCB assembly to the display.

879A

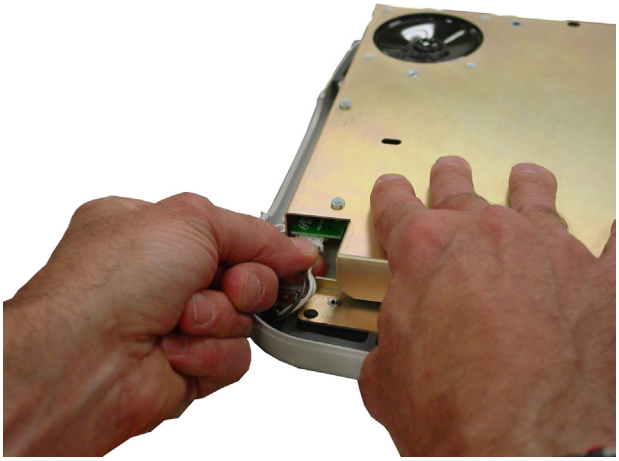
14. Close the unit in reverse order that you opened it. See "Open the Unit" on page 6-22.

Replacing the Front Plastic

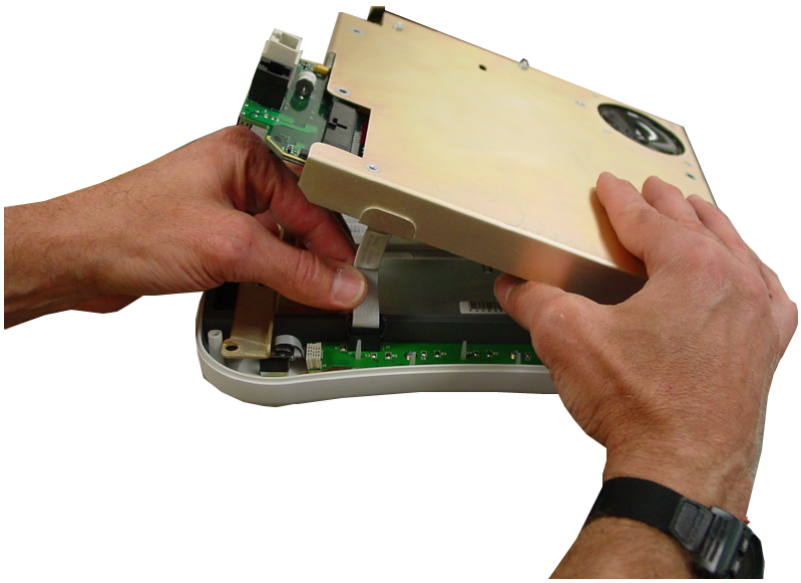
1. Open the Unit. See “Open the Unit” on page 6-22.
2. Remove the four screws holding the main PCB assembly to the display sub-assembly.

879A

3. Pull out friction connector from the inverter PCB. Do not pull on the connector wires.

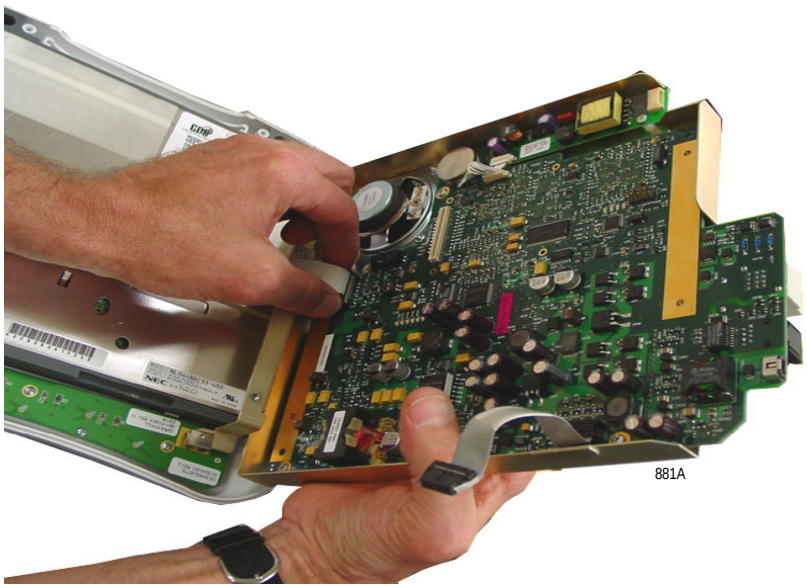

878A

4. Squeeze the connector tabs and pull out the connector from the keypad PCB.



880A

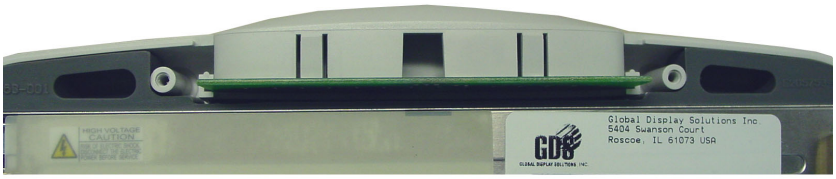
5. Pull out the display friction connector from the main PCB. Do not pull on the ribbon cable.



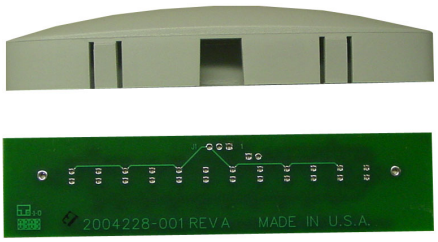
881A

6. Remove the main PCB assembly and set it aside.
7. Place the display sub-assembly face-down with the **Trim Knob** control hanging over the edge of the work surface.

8. Remove the blank PCB and blank lens cover and set them aside. You will re-use these two components.

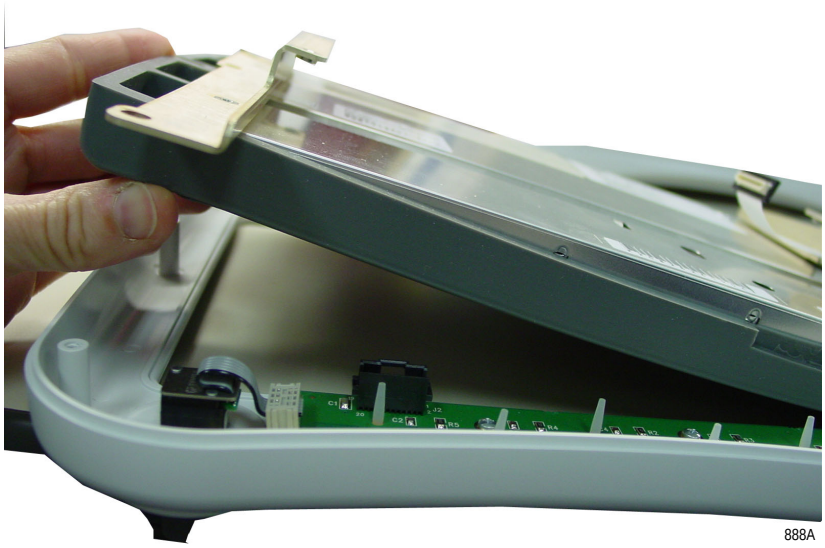


886A



887A

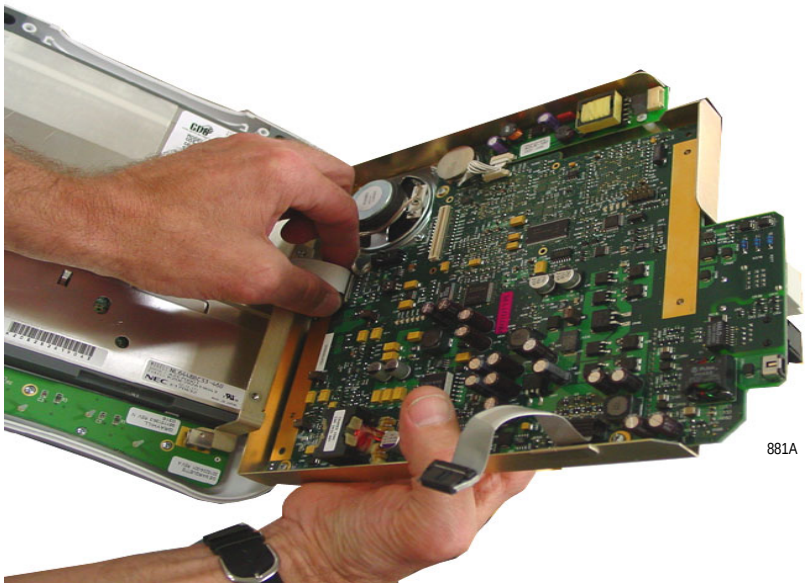
9. Remove the LCD and rubber display isolator and set them aside.



888A

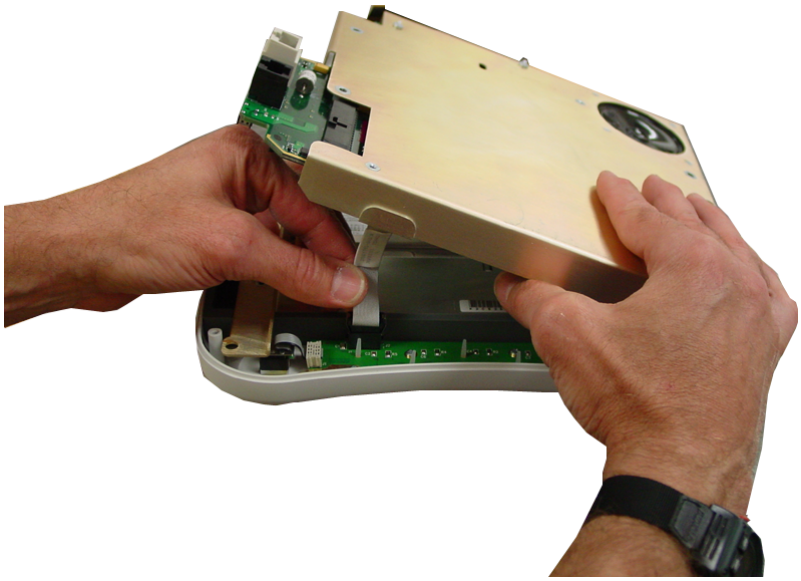
10. Install the LCD and rubber display isolator into the new display plastic.
11. Install the blank PCB and blank lens cover.

12. Insert the display friction connector into the main PCB connector.



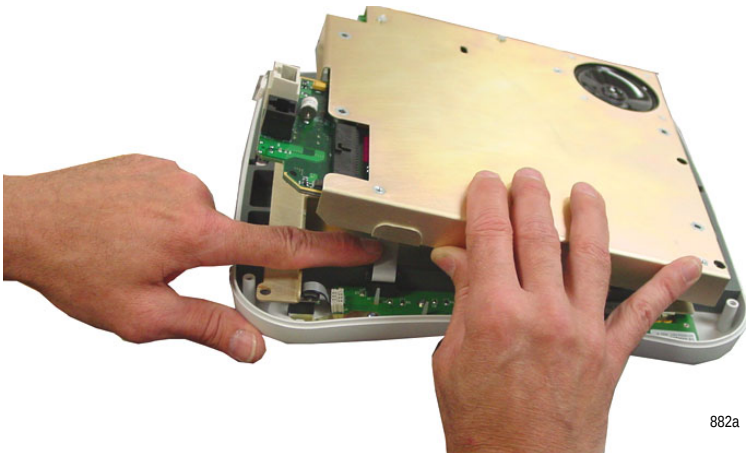
881A

13. Insert the keypad PCB connector into the keypad PCB.

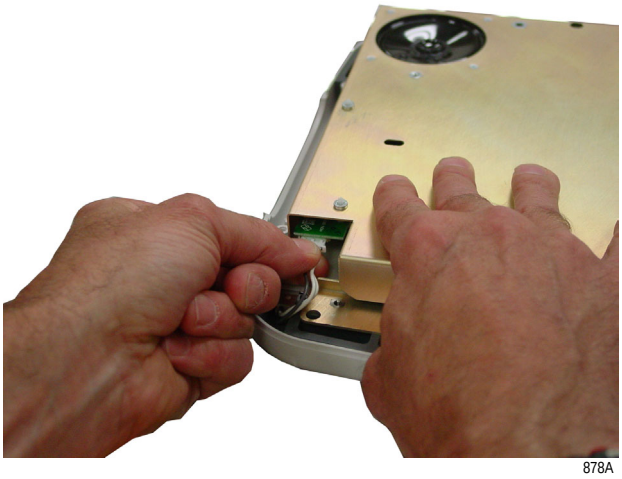


880A

14. Tuck in the keypad PCB ribbon cable to prevent it from being damaged.



15. Insert the display friction connector into the inverter PCB connector.



16. Install four screws to secure the main PCB assembly to the display.

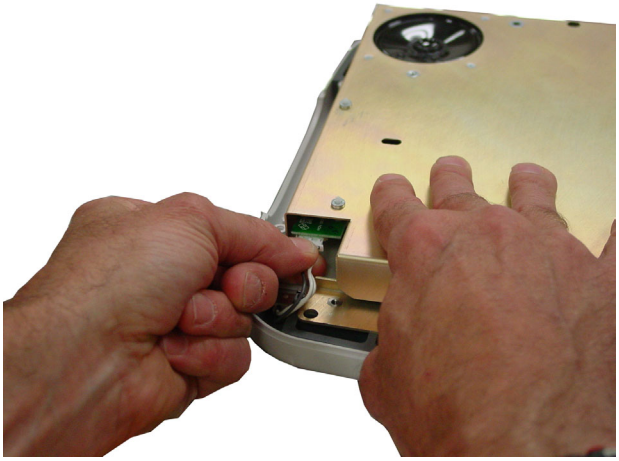
17. Close the unit in reverse order that you opened it. See "Open the Unit" on page 6-22.

Replacing the Speaker Assembly

1. Open the Unit. See “Open the Unit” on page 6-22.
2. Remove the four screws holding the main PCB assembly to the display sub-assembly.

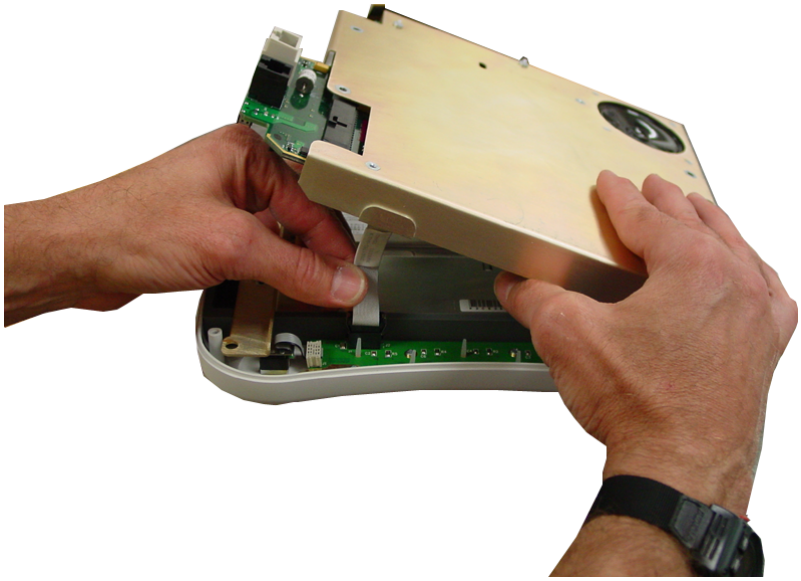
879A

3. Pull out friction connector from the inverter PCB. Do not pull on the connector wires.



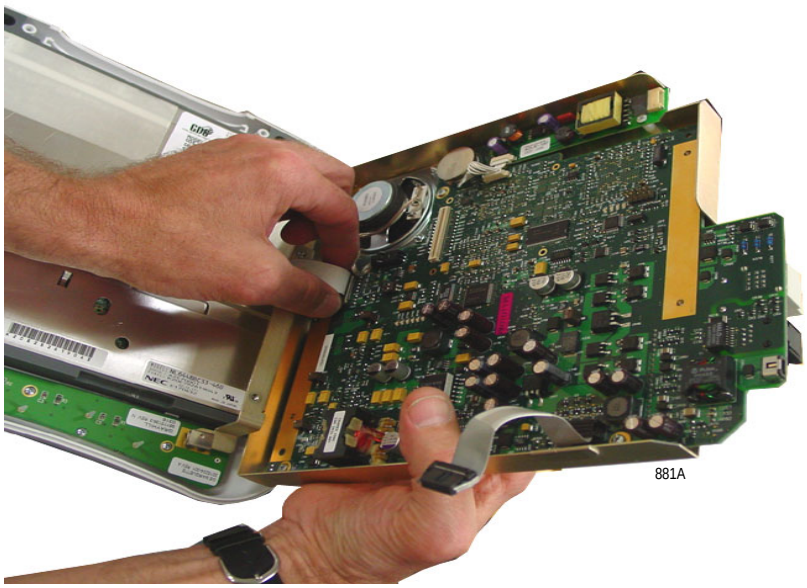
878A

4. Squeeze the connector tabs and pull out the connector from the keypad PCB.



880A

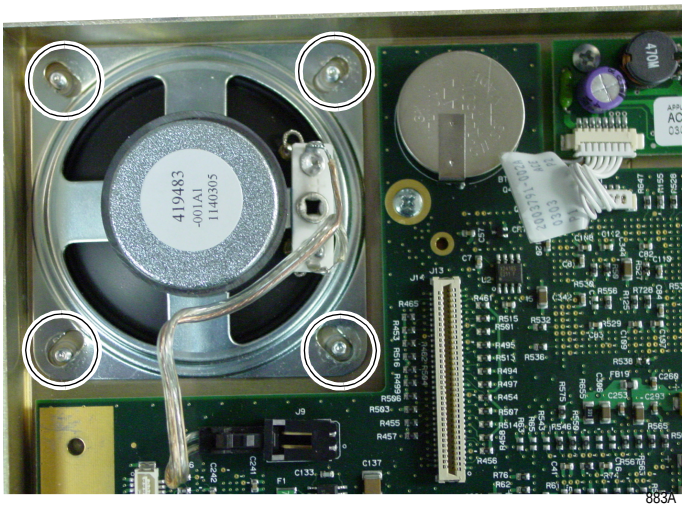
5. Pull out the display friction connector from the main PCB. Do not pull on the ribbon cable.



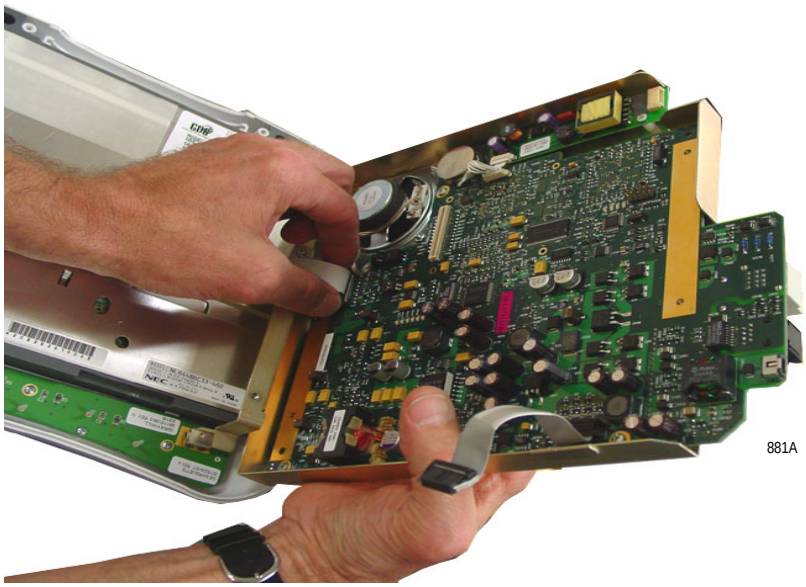
881A

6. Remove the main PCB assembly and place on a flat surface.
7. Place the display sub-assembly face-down with the **Trim Knob** control hanging over the edge of the work surface.

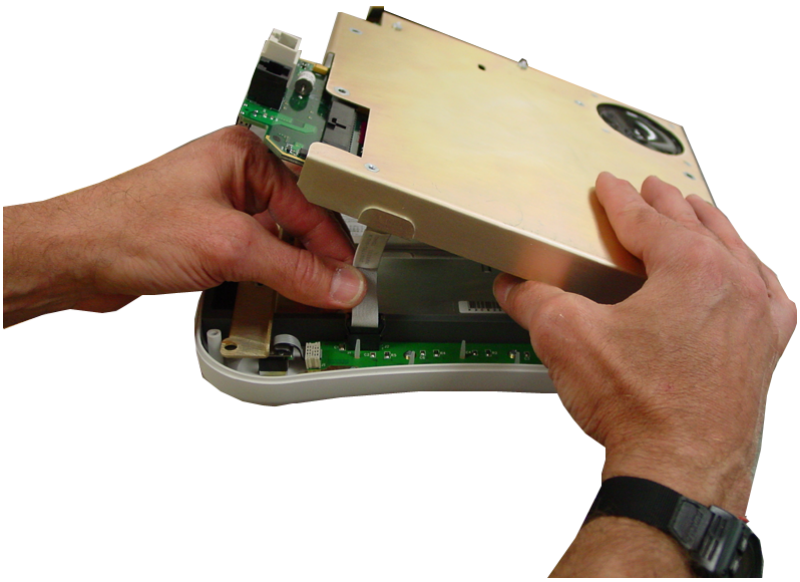
8. Remove the four nuts holding the speaker onto the main PCB assembly.



9. Disconnect the speaker harness from the main PCB assembly.
10. Install the new speaker.
11. Insert the display friction connector into the main PCB connector.

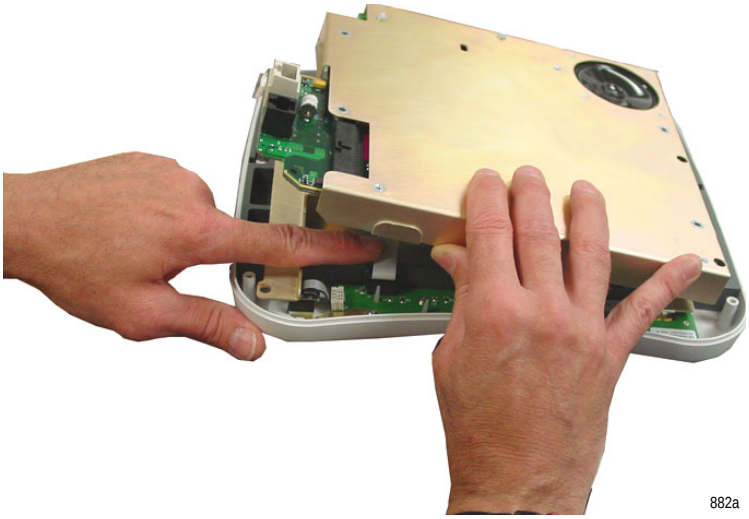


12. Insert the keypad PCB connector into the keypad PCB.



880A

13. Tuck in the keypad PCB ribbon cable to prevent it from being damaged.



882a

14. Insert the display friction connector into the inverter PCB connector.

878A

15. Install four screws to secure the main PCB assembly to the display.

879A

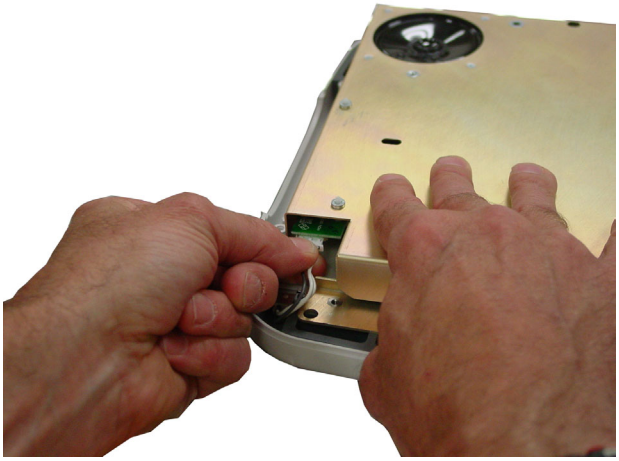
16. Close the unit in reverse order that you opened it. See "Open the Unit" on page 6-22.

Replacing the Inverter PCB

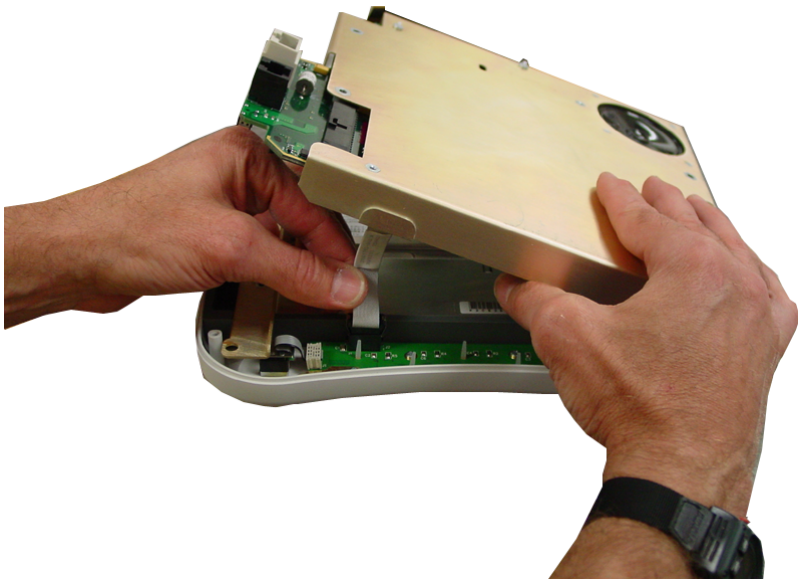
1. Open the Unit. See “Open the Unit” on page 6-22.
2. Remove the four screws holding the main PCB assembly to the display sub-assembly.

879A

3. Pull out friction connector from the inverter PCB. Do not pull on the connector wires.

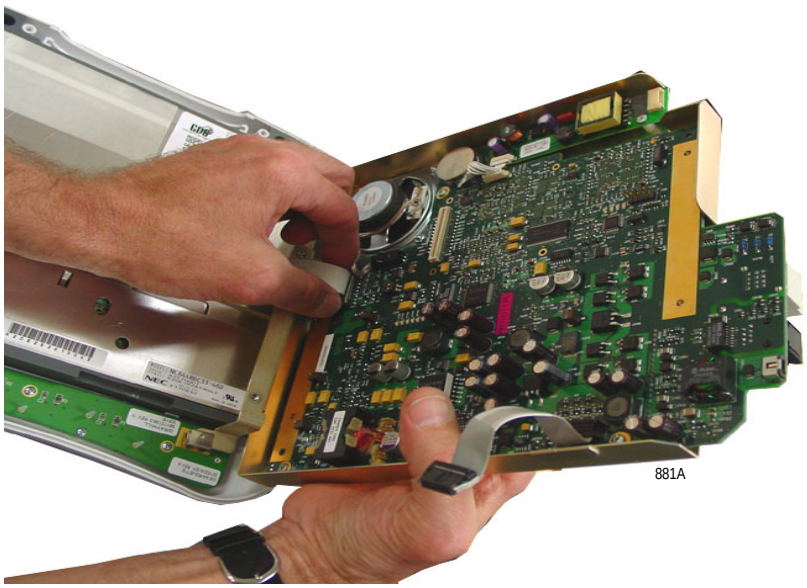

878A

4. Squeeze the connector tabs and pull out the connector from the keypad PCB.



880A

5. Pull out the display friction connector from the main PCB. Do not pull on the ribbon cable.



881A

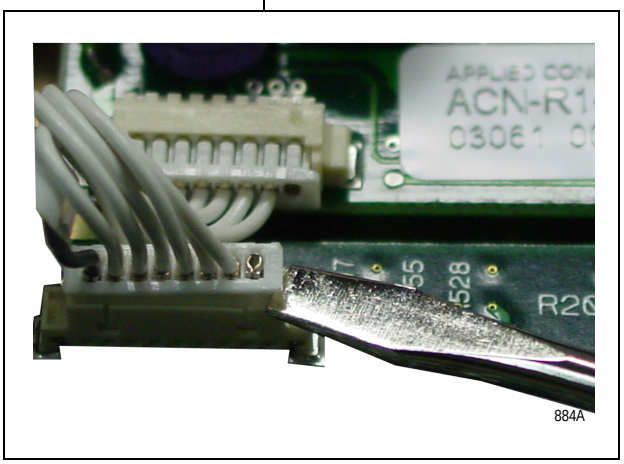
6. Remove the main PCB assembly and place on a flat surface.
7. Place the display sub-assembly face-down with the **Trim Knob** control hanging over the edge of the work surface.

8. Remove the two screws holding the inverter board onto the main PCB assembly.

885A

9. Remove the backlight friction connector from the main PCB assembly.

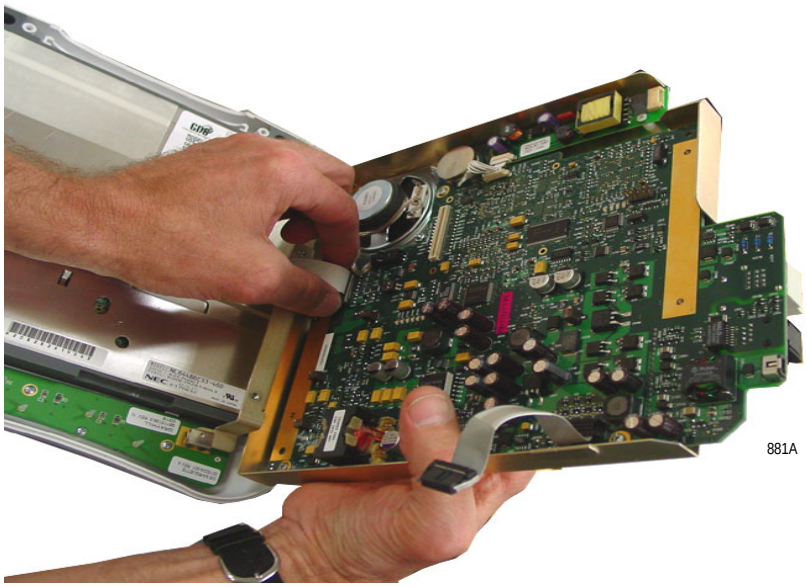
885A



884A

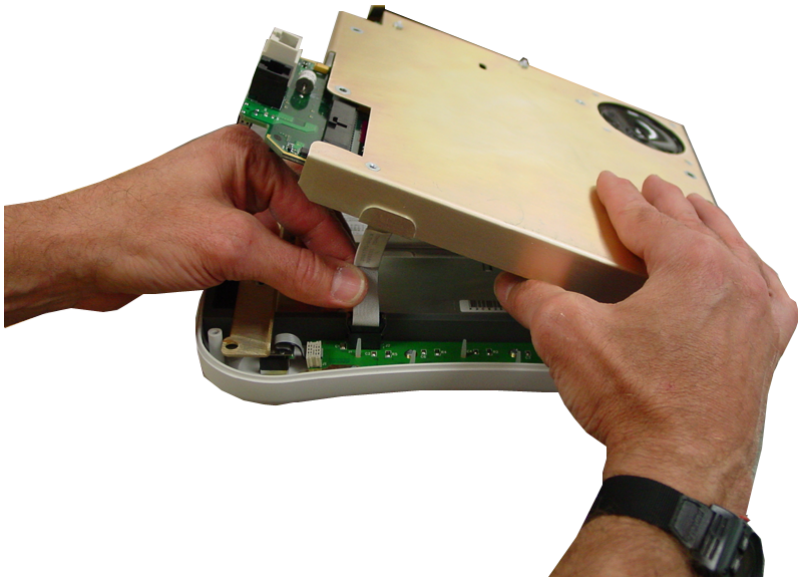
10. Install the new inverter board onto the main PCB assembly.

11. Insert the display friction connector into the main PCB connector.



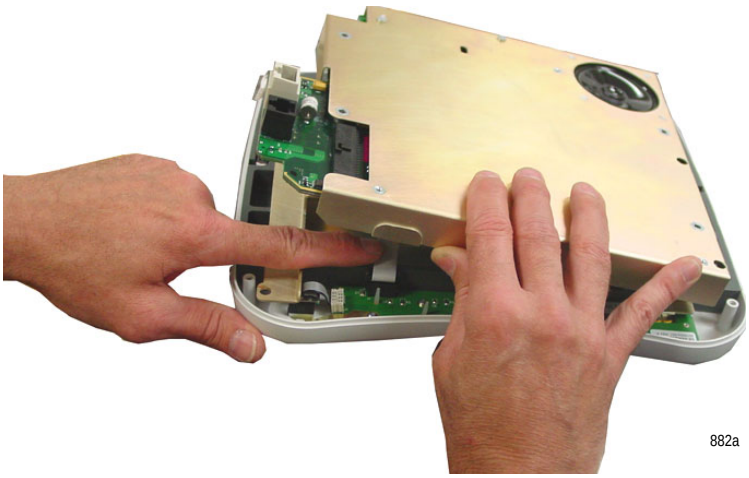
881A

12. Insert the keypad PCB connector into the keypad PCB.

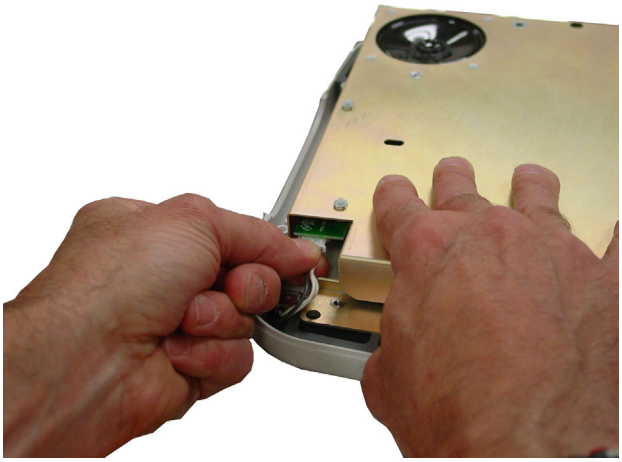


880A

13. Tuck in the keypad PCB ribbon cable to prevent it from being damaged.



14. Insert the display friction connector into the inverter PCB connector.

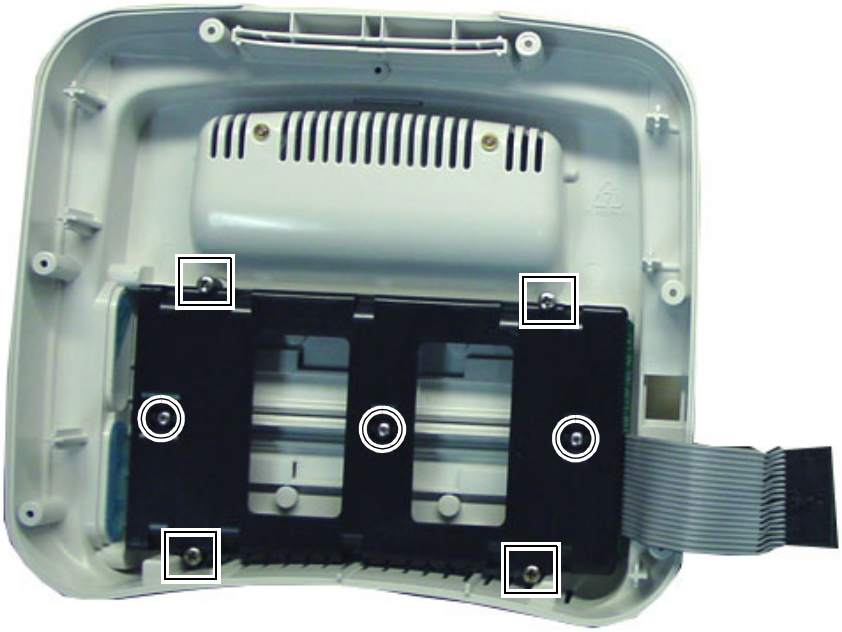


15. Install four screws to secure the main PCB assembly to the display.

16. Close the unit in reverse order that you opened it. See “Open the Unit” on page 6-22.

Replacing the Main PCB Assembly

1. Open the Unit. See “Open the Unit” on page 6-22.
2. Remove the seven screws from the battery housing located in the back half of the unit.

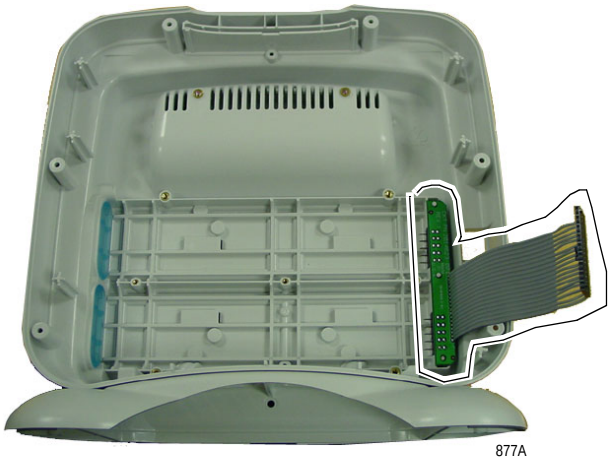


876A

= 4 large screws

= 3 small screws

3. Remove the battery harness from the back half of the unit.

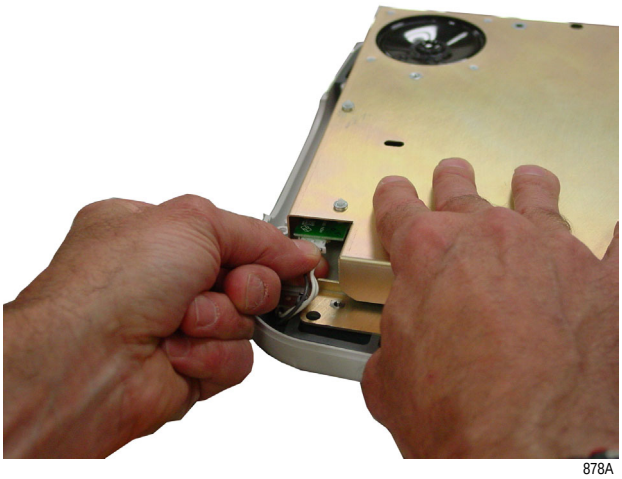


remove harness

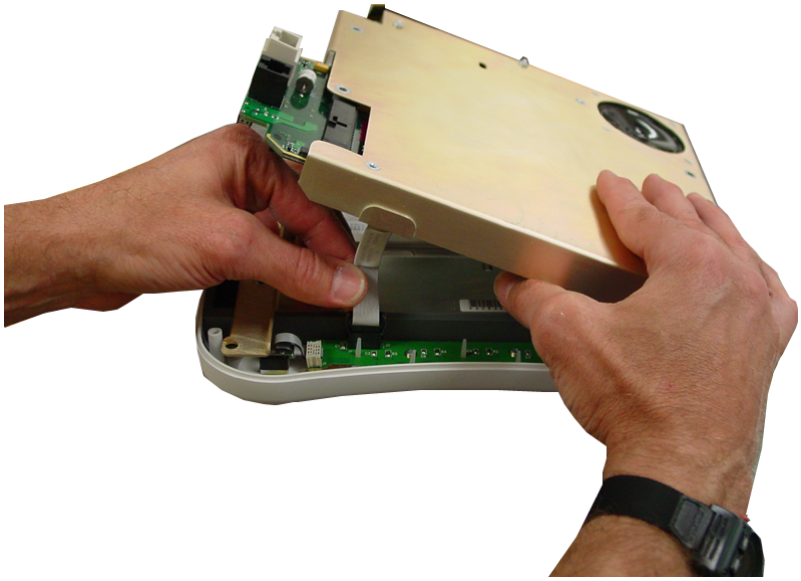
877A

4. Remove the four screws holding the main PCB assembly to the display.

5. Pull out friction connector from the inverter PCB. Do not pull on the connector wires.

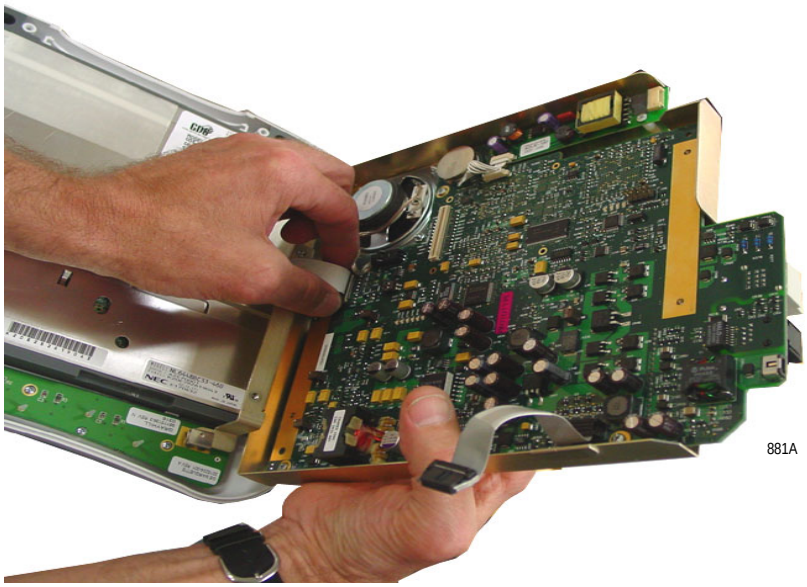


6. Squeeze the connector tabs and pull out the connector from the keypad PCB.



880A

7. Pull out the display friction connector from the main PCB. Do not pull on the ribbon cable.

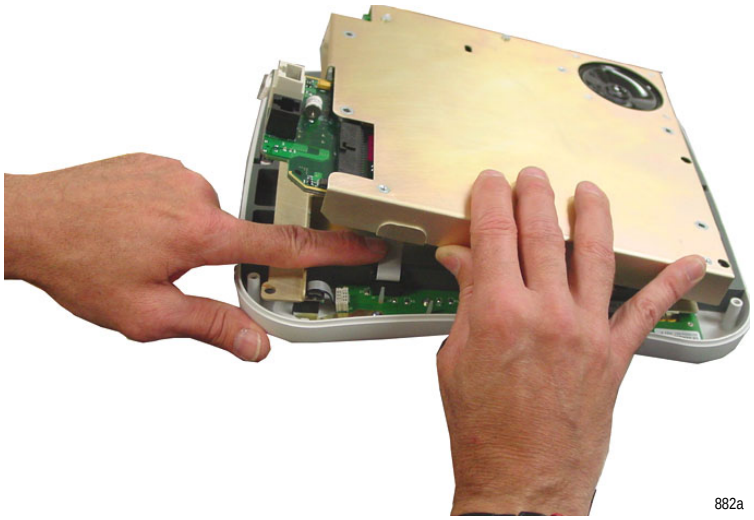


881A

8. Remove the defective PCB. Follow your country requirements for PCB disposal.
9. Install new main PCB assembly.
10. Reassemble the display assembly and close the unit in reverse order.

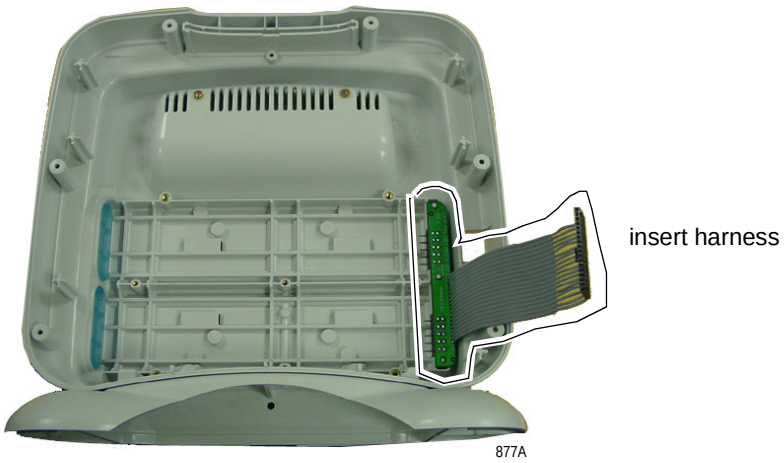
NOTE

When connecting the keypad PCB harness, be sure to tuck in the ribbon cable to prevent it from being damaged.

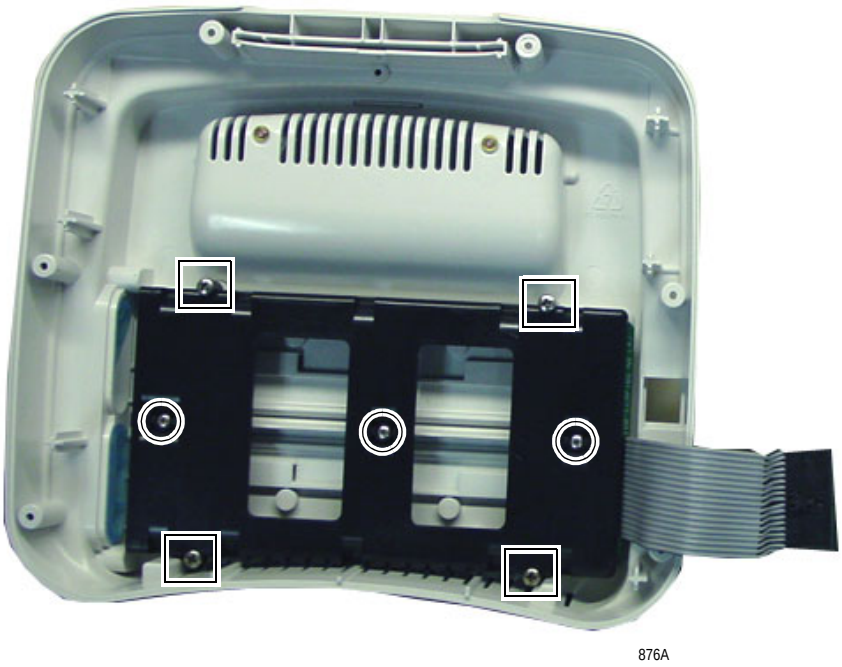


11. Install four screws to secure the main PCB assembly to the display.

12. Insert the battery harness into the back half of the unit.

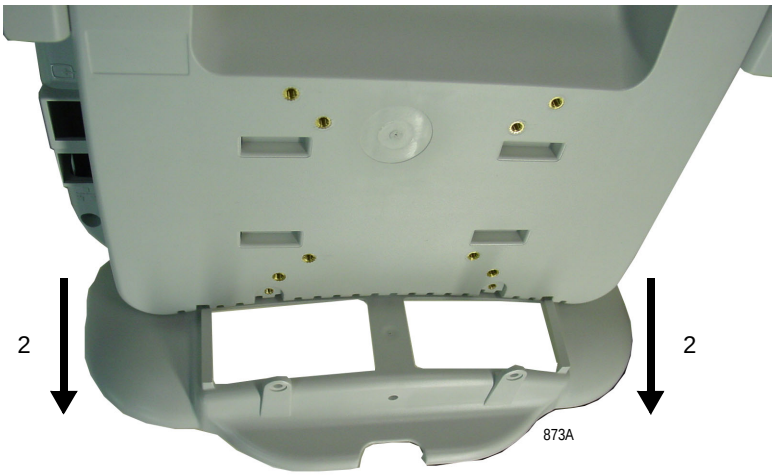


13. Install the seven screws for the battery housing.



14. Close the unit in reverse order that you opened it. See "Open the Unit" on page 6-22.

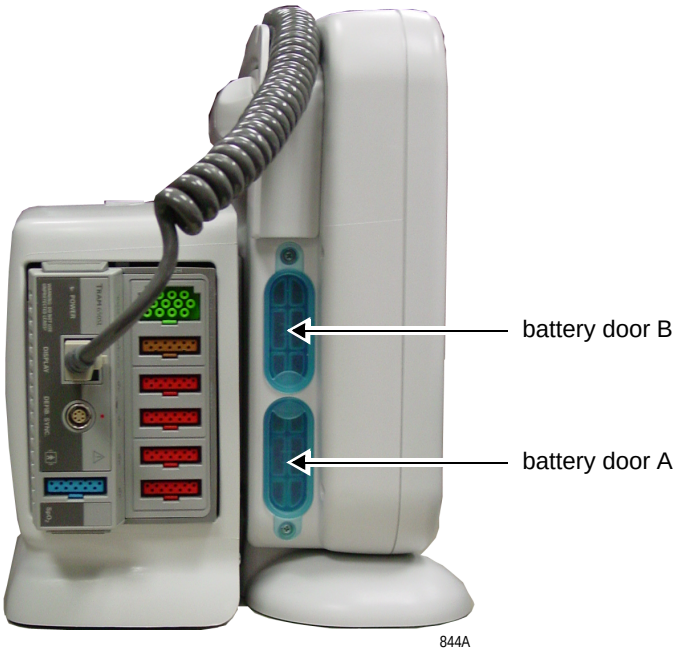
Replacing the Foot



1. Remove the two screws that attach the foot to the display.
2. Pull to slide the foot out of the display grooves.
3. Slide the new foot into place and install the screws.

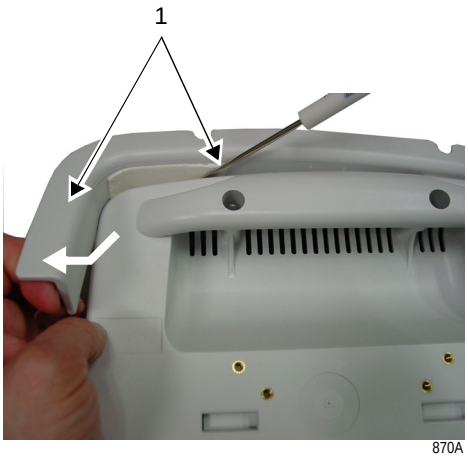
Replacing the Battery Doors

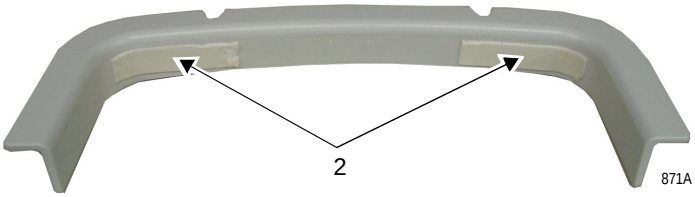
1. Open the battery door and remove the battery door screw.
2. Insert battery door B into the top position and battery door A into the bottom position.

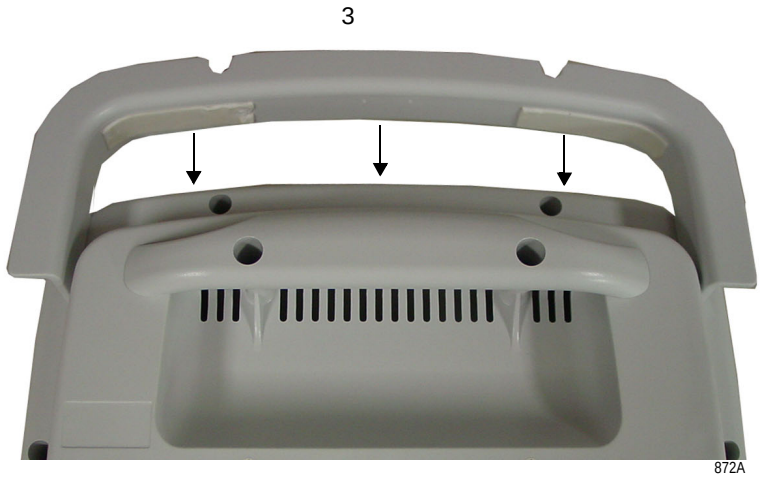


3. Insert and tighten the battery door screw.

Replacing the Collar







1. Flex the collar away from the display and gently use a small bladed screwdriver to release the tape adhesive that attaches the collar to the display.
2. Carefully remove residual adhesive from the display.
3. Remove the protective film from the adhesive tape.
4. Place the collar on the edge of the display and slide the collar until it is in position. Press the collar firmly against the display to adhere the collar to the display.

After Assembly

After re-assembling the monitor, ALWAYS complete the checkout procedures, electrical safety tests, and regular maintenance procedures identified and described in this manual.

Recommended Electrical Safety Tests and Checkout Procedures		
Replacement or Upgrade Procedure	**Checkout Procedures**	**Electrical Safety Tests**
Main PCB Assembly FRU	1. "Monitor Power-up Tests" on page 4-25. 2. "Battery Tests" on page 4-26. 3. "Display Tests" on page 4-28. 4. "Speaker Test" on page 4-28. 5. "Tram Module Communication Test" on page 4-29.	1. "Ground (Earth) Integrity" on page 4-19. 2. "Ground (Earth) Wire Leakage Current Tests" on page 4-21. 3. "Enclosure Leakage Current Test" on page 4-22.
Inverter PCB Harness FRU	■ "Display Tests" on page 4-28	
Software FRU	1. "Monitor Power-up Tests" on page 4-25. 2. "Battery Tests" on page 4-26. 3. "Display Tests" on page 4-28. 4. "Speaker Test" on page 4-28. 5. "Tram Module Communication Test" on page 4-29.	
Display Sub-Assembly FRU	1. "Monitor Power-up Tests" on page 4-25. 2. "Battery Tests" on page 4-26. 3. "Display Tests" on page 4-28.	
Front Plastic with Switch Assemblies FRU	■ "Monitor Power-up Tests" on page 4-25.	
Speaker Assembly FRU	■ "Speaker Test" on page 4-28.	
Foot Assembly FRU	■ None	■ None
Collar Assembly FRU	■ None	■ None
Battery Doors FRU	■ None	■ None

A Appendix A – Technical Specifications

NOTE

Due to continual product innovation, specifications are subject to change without notice. The following specifications are accurate as of the date of this publication, and pertain to the monitor.

For your notes

Product Specification

Display

Size:	10.4-inch diagonal
Type:	active-Matrix Liquid Crystal Display (LCD)
Resolution:	640 by 480 pixels
Number of traces:	6
Sweep speeds:	6.25, 12.5, 25 mm/sec (ratio to amplitude) for BP, respiration, and SpO_2 25 mm/sec (ratio to amplitude) for ECG
Waveform display options:	individual 6 waveforms, individual 3 waveforms, full, and full grid modes
Information window:	displays non-real-time information without obstructing the display of real-time information
Display organization:	prioritized by parameter

Battery Operation

Battery type:	exchangeable Lithium-Ion
Number of batteries:	up to 2
Voltage:	11.1 V nominal
Capacity:	3.9 Ah
Charge time:	less than 4 hours
Run time: one battery: two batteries:	 up to 2 hours up to 4 hours
Battery life:	500 cycles to 50% capacity

Environmental Specifications

Power requirements:	battery or external DC power supply
Power consumption:	60W with Tram module connection (maximum)
Cooling:	convection
Power Dissipation:	120 Btu/Hour (maximum)

DC Power Supply

Optional, external AC/DC converter	
Input:	85- 270 VAC, 50/60 Hz single phase
Output:	16.75 VDC at 4.0 amps

Operating Conditions

Ambient temperature:	10 to 40°C (50 to 104°F)
Relative humidity:	5 to 95% at 40°C
Vibration:	MIL-STD 810E, Method 514.4, Category 1

Storage Conditions

Maximum:	70°C (158°F) at 95% relative humidity
Minimum:	-40°C (-40°F)
Batteries:	-20°C to 60°C (-4°F t0 140°F)

Product Durability Specifications

Fluid ingress test	Meets IEC 601-2-27
Drop test standard	76.2 cm (30 inches)
Vibration test	MIL-STD 810E Method 514.4, category 1

Physical Specification

Transport Pro Monitor

Height:	29.3 cm (11.5 inches)
Width:	29.3 cm (11.5 inches)
Depth:	13.2 cm (5.2inches) without Tram chute 21.9 cm (8.6 inches) with Tram chute
Weight	3.0 kg (6.5 lbs) (without batteries)

Tram Chute

Height:	19.4 cm (7.6 inches)
Width:	29.8 cm (11.7 inches)
Depth:	12.7 cm (5.0 inches)
Weight	1.36 kg (3 lbs) without Tram module

Certification

UL 2601-1 classified.
UL classified for CAN/CSA C22.2 No. 601.1
IEC 60601-1 certified
CE marking for Council Directive 93/42/EEC Medical Device Directive

For your notes

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